

MARVIN C. MALLON

Exploring the Radio Shack Model 100



CBS Computer Books

EXPLORING THE TRS-80 Model 100™

Marvin C. Mallon

CBS Computer Books

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Author Biography

Marvin C. Mallon is a professional microcomputer programmer and business consultant. He has advised hundreds of first-time users in the selection of both equipment and software. He has authored many technical articles dealing with a variety of computer hardware dating back to 1976, the dawn of the Age of the Micros. Presently he is serving his third term as a member of the Board of Directors of the Los Angeles chapter of the I.C.C.A. (Independent Computer Consultants Association). In addition to participating in numerous seminars, he has taught courses in BASIC programming to a broad cross-section of interested newcomers to the computer world. Mr. Mallon has more than seven years of experience in this very fast-paced industry and has contributed in a variety of ways to its growth.



Dedication

To my daughter Sarb Nam, who has discovered how to
blend twentieth century technology and a fifteenth century
philosophy, and to my son Douglas, the helpful instrument
for my endeavors.



Acknowledgments

No technical book is ever the product of a single individual. The author, if he or she is a thorough worker, compiles information from many sources to improve the value of the book to the reader. Such was certainly the case here. I am indebted to many people for the assistance, both technical and spiritual, that helped produce this book.

At Radio Shack - Fort Worth, I received support from Ms. Amy Arutt, Marketing Information Co-ordinator, Mr. Stewart Weinstock, Computer Merchandise Buyer and others. Local Radio Shack Computer Center personnel such as Steve McGovern, Larry Wake and Clem Boylan were similarly co-operative and their advice proved invaluable. Many of the photos and illustrations contained in this book were made available through the courtesy of Radio Shack, a division of Tandy Corporation.

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My editor, Dave Dusthimer, and his colleagues at Holt, Rinehart and Winston and Connie Kellner of the Publisher's Network must share the credit for the magic that translates a rough manuscript and crude sketches into the finished book you hold in your hands.

Mr. Fred Blechman, one of the most prolific technical authors in the country, deserves mention as the friend whose advice and support helped get me past the difficult areas.

Lastly, my wife Reva is to be commended for providing the work environment that made doing this book not only a possibility but a pleasure as well.

Marvin Mallon

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Preface

Computers, like many of technology's miracles, have come a long way in a relatively short period of time. Unlike the airplane or television, however, they began as large machines and evolved into the compact marvels we see today. Back in the '40's, computers started as 747's and have now reached the Piper Cub stage. Where they once filled whole rooms, they now reside comfortably in your hand; retaining much of the power and adding speed to what they had forty years ago. It has been a long technological leap from the ENIAC of that era to the personal microcomputer of today. Many inventions and developments contributed to this situation, but none so dramatically as the introduction of solid state electronics — the transistor and all that followed after it.

Within the last decade, we have witnessed the dawn of the microprocessor and the family of machines spawned by that creation. It is less than two years since the portable (more appropriately, "luggable") computer reached the market. Further shrinking of the computer architecture — along with a host of clever innovations — has now produced the briefcase-sized computer. This book is about one such device, the TRS-80 Model 100. This superbly compact microcomputer, having the same width and length as a sheet of notebook paper and weighing less than four pounds, is one of a number of micros manufactured in Japan and sold in the United States. NEC (Nippon Electric Company) markets a nearly identical version, their model PC-8201A. Olivetti, Kaypro and others will soon introduce similar machines and a proliferation of "lappables" is certain to occur during the next 12 months.

Whether you already own a TRS-80 Model 100 or are thinking of buying one, you should know what it can, and cannot do. It is by no means a replacement for its "big brother", the desk-sized personal computer. With their larger and more legible screens, the standard PC's do permit the running of accounting programs, database generators and a variety of other valuable software that is ill-fitted to the TRS-80 Model 100. Similarly, the "compact" personal computers are capable of much more than is Tandy's little wonder. That's not surprising since they are simply 30 pound versions of the desk models with a carrying handle attached.

What the TRS-80 Model 100 can do, however, is remarkable enough. It has complete portability, meaning that its internal batteries permit its operation anywhere. Its low-power memory stores all of your entries even after the main switch has been turned off, a feature lacking in the larger machines. Telecommunications, bar code reading and cassette storage area are some of the additional major virtues of the TRS-80 Model 100. Perhaps its usefulness as a lap-size word processor is its strongest feature. In any event, it performs the tasks beautifully for which it was created, namely as a multi-purpose instrument for "people-on-the-go". For no small reason was it declared the "Hardware product-of-the-year" by Infoworld magazine in January of 1984.

Recognizing that you may not be an experienced computer user, this book attempts to explain the operation of the TRS-80 Model 100 in an easily digestable manner. Where jargon is unavoidable it is defined immediately rather than requiring you to jump to a technical glossary. Clear-cut illustrations are used to help make points that words alone wouldn't cover adequately. In addition, useful appendices are included that chart many of the important graphics and programming functions. Hopefully, this book will enable you to get full value from the machine by exploring, function by function, all of the features it has to offer.

Marvin Mallon

PART I The Machine

CHAPTER 1 Surveying the Keyboard

STARTING UP

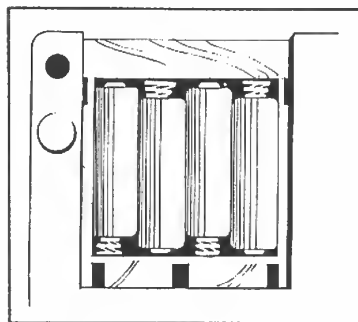


Figure 1.1 Installing the batteries

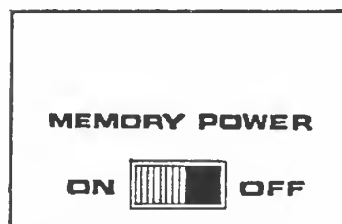


Figure 1.2 The memory power switch

You have just invested in a remarkable, bantam-weight micro-computer, the TRS-80 Model 100. If this is the first time out of the shipping box for your new electronic helpmate, it might be appropriate to run through the set-up procedure. A saying that dates back to the beginning of the microcomputer age states, "If all else fails, read the manual." Rather than wait for something to fail or, worse yet, for some damage to occur, you are well advised to make your way through the *TRS-80 Model 100 Portable Computer User's Manual*. This owners guide contains start-up information which can be condensed as follows:

1. Get 4 size AA alkaline batteries and place them in the slide-out compartment on the bottom of the machine (Figure 1-1).
2. Switch the **Memory Power** switch (located underneath the unit) to ON (Figure 1-2).
3. Slide the ON OFF main power switch to ON (Figure 1-3).



Figure 1.3 The "on/off" switch

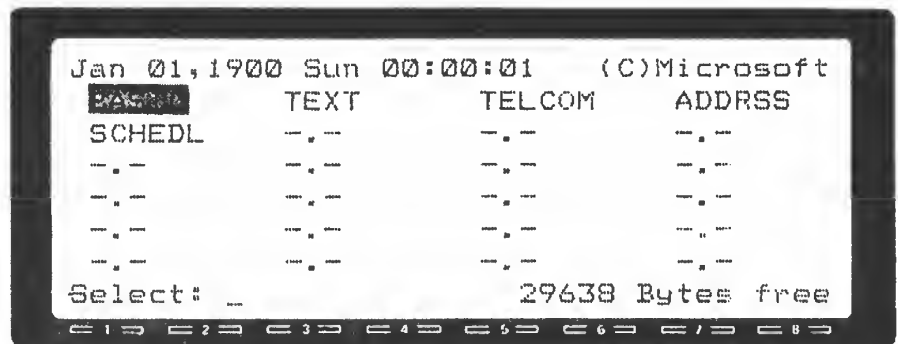


Figure 1.4 The main menu display

4. You should get a display similar to that shown in Figure 1-4.

Alternatively, if you purchased the optional AC Power Adapter (part number 26-3804) plug it into the DC 6V connector as illustrated in Figure 1-5. This unit will save a lot of battery expense when your Model 100 is used at a desk and portability is not a factor. At best, the batteries will supply power for about 20 hours before replacement is necessary. Invest in plenty of extras but use the AC Power Adapter whenever a 110 volt wall plug is handy.

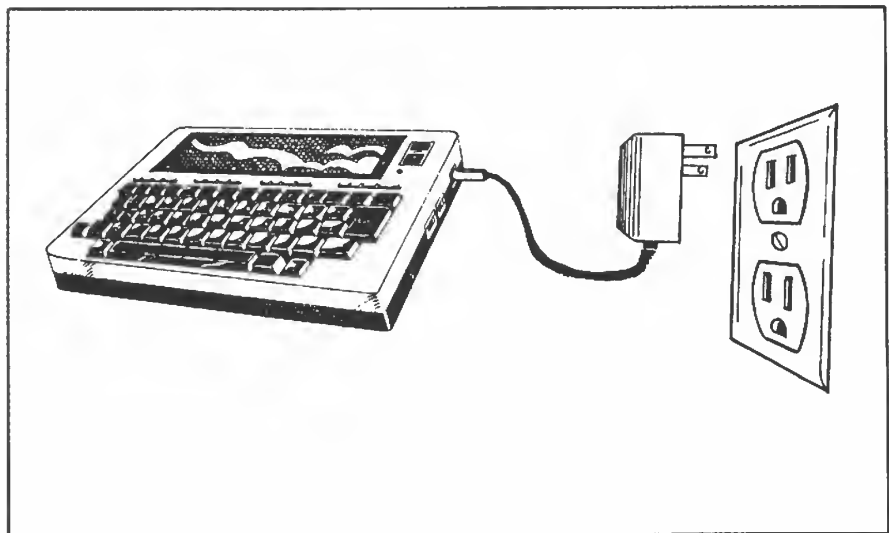


Figure 1.5 The optional AC power adapter

ON/OFF and Display Controls

As you previously discovered, the ON/OFF switch is located on the right-hand edge of the TRS-80 Model 100. If it's in the ON position but you don't touch the keyboard for about 10 minutes, the machine will turn itself off to conserve power. It is then necessary to slide the ON/OFF switch back to OFF, and then to ON the next time you wish to activate the computer. This "time-out" feature can be set for other time periods or cancelled altogether. Refer to the POWER command as explained in chapter 9 or in the BASIC section of the *Owner's Manual*. Any program material you might have entered into the machine will be retained. This automatic "shut-down" of the Model 100 does not erase anything previously entered. Note that the TRS-80 Model 100 maintains the day, date and time. A small, built-in NiCAD (Nickel Cadmium) back up battery keeps the clock going as well as supplying the little amount of power required by the internal memory. As long as the MEMORY POWER switch is turned ON, this battery will do the job until it reaches its end-of-life (approximately 2 1/2 years). Its replacement can be easily accomplished by Radio Shack service personnel.

The DISPlay control is also on the right-hand edge of the machine (Figure 1-3) and permits you to alter the LCD (Liquid Crystal Display) appearance to suit your taste and viewing angle. You can't hurt a thing by experimenting with various settings of this control. You will probably find that it needs to be adjusted when you move the Model 100 from a desk to your lap.

Setting the correct day, date and time is the next order of business and is accomplished (see Figure 1-6) as follows:

1. Since BASIC is highlighted on the LCD and that's where you want to go, press the <enter> key.
2. Type: date\$ = "06/01/84" <enter> using today's date in the format MM/DD/YY. It is necessary to enter two digits for each of the periods; for example, June becomes "06".
3. Type: time\$ = "14:07:30" <enter> using the correct time in the format HH:MM:SS and adding twelve to the after-

noon hours. Don't forget the leading zeros as shown in the date example above.

4. Type: `day$ = "mon"` <enter> using the current day of the week. Only the first three letters of the appropriate day's name are to be entered.
5. Type: `menu` <enter> and you'll exit BASIC and return to the Main Menu display.

```
Ok
date$="06/01/84"
Ok
time$="14:07:30"
Ok
day$="mon"
Ok
```

Figure 1.6 Setting the day, date and time

Hereafter, your TRS-80 Model 100 will maintain the correct day, date and time except for Leap Year's February 29th which the machine does not recognize. The procedure need not be repeated unless the internal NiCAD battery requires replacement or more RAM (Random Access Memory) modules are added to the machine.

We are now ready to begin our survey of the keyboard and other important controls. Figure 1-7 illustrates that the keyboard occupies fully two-thirds of the face of the computer.

The QWERTY Keyboard

There are 45 keys that constitute the main typing portion of the keyboard (Figure 1-8). The entire alphabet, as well as numbers, punctuation marks, special characters and the space



Figure 1.7 The Radio Shack TRS-80 MODEL 100

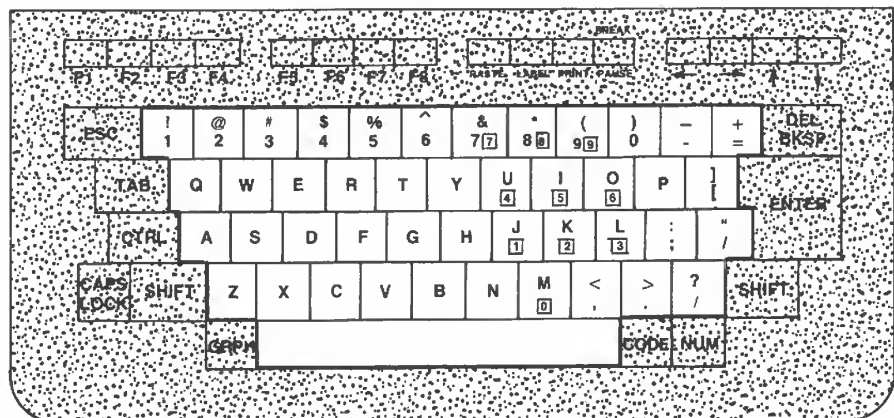


Figure 1.8 The "QWERTY" keyboard

bar are represented here just as they are on most typewriters. A few of the symbols and the location of others may differ from what you see on your Smith-Corona, but, by and large, this is the same keyboard you've worked with before. Be assured that you can't hurt the computer by experimenting with the keys.

A few of the symbols are notably different than those you

may be familiar with. Their presence is explained principally because of their usefulness in creating BASIC programs. The < and > symbols represent the mathematical terms "less than" and "greater than". The asterisk is still an asterisk, but doubles as the sign of multiplication in BASIC programming.

QWERTY derives its name, of course, from the first six letters on the second row. Other, more efficient keyboards have been designed (notably the DVORAK) but it seems evident that the QWERTY is too ingrained in our culture to permit variation.

As on a typical typewriter, a right and left shift key can be found at the ends of the fourth row (Figure 1-9). Either one will put you in the capital letter mode. A "press on/press off" CAPS LOCK key serves to take you from lower to uppercase while the ENTER key performs much the same function as the RETURN. The TAB key also acts in a manner similar to typewriter operation. Pressing it advances the cursor (the blinking black square) eight spaces to the right. After the fourth tabbing to the right, the cursor advances one line and returns to the left-hand edge of the display. TAB is used with TEXT, the built in word processing program (more on that in Chapter 10) and in BASIC programs only.

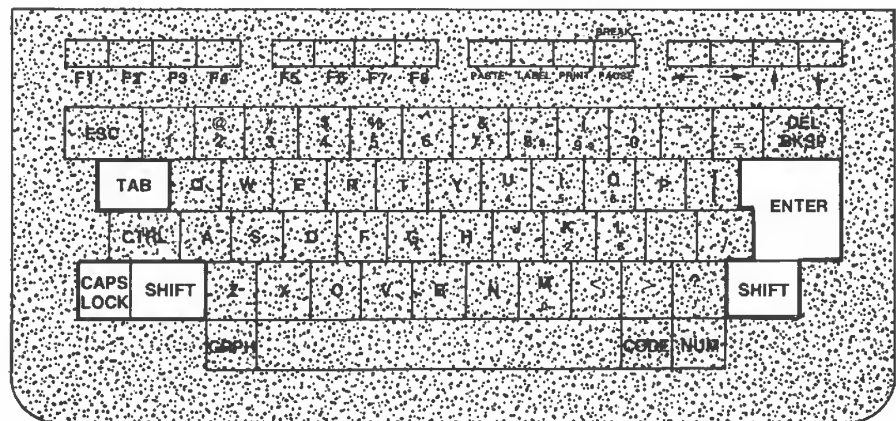


Figure 1.9 The caps lock, enter, tab and shift keys

The key labeled CTRL (control), (Figure 1-10) located on the left-hand edge of the third row, is never used by itself but performs special functions in conjunction with other keys.

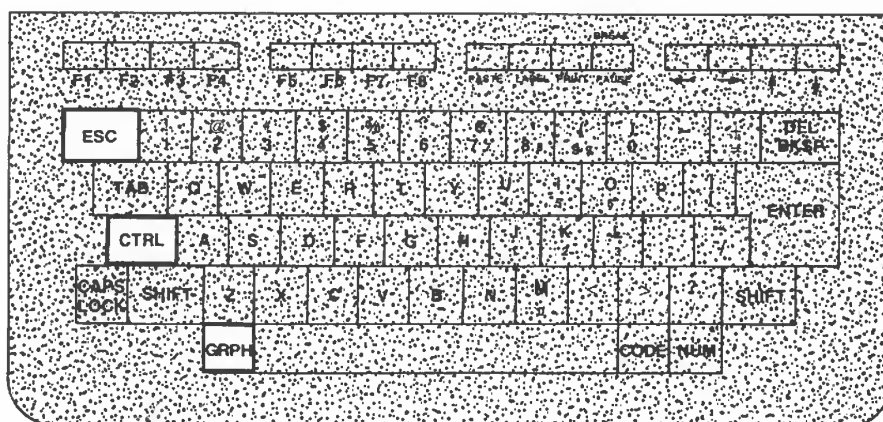


Figure 1.10 The ESC (escape), CTRL (control) and GRPH (graphic) keys

For example, the combination of pressing the CTRL key and the letter M simultaneously will move the cursor down one line. A complete chart of control key functions can be found in Appendix A at the back of this book.

The ESC (escape) key in the upper left-hand corner serves a limited purpose. When you press it twice in succession while in the TEXT mode you will be returned to the Main Menu. Certain escape sequences, where this key is used in unison with others, are itemized in Appendix B.

The GRPH (graph) key is located in the lower left-hand position of the keyboard. When in BASIC it can be used to display 73 different symbols if pressed in combination with other keys. A complete list of these graphics can be found in Appendix I. The graphics symbols available include miniature characters of human figures, playing card suits, arrows, checkerboard patterns and a variety of other useful, albeit unusual, pictures. They can be imbedded in BASIC programs that you create or can be conjured up by simply pressing the GRPH key and another key simultaneously. Thirty-nine symbols are available in that manner; another thirty-four if the SHIFT key is pressed as well.

The key labelled CODE to the right of the space bar (Figure 1-11) is used in the same manner as the GRPH key. It produces another thirty-two special characters when used in conjunction with other keys. Twenty-nine more are created when the SHIFT key is added to the combinations. The characters generated by the CODE key are principally upper and lower case foreign language vowels. This arrangement per-

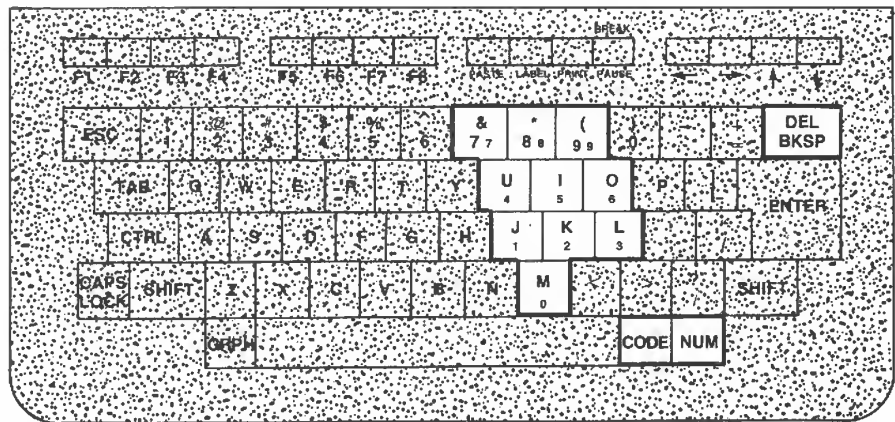


Figure 1.11 The CODE, NUM (number) and DEL (delete)/BKSP (backspace) keys

mits you to compose documents in French, Swedish and other European alphabets using the TEXT program (see chapter 10) that is available in this machine. All together, therefore, some 134 symbols can be produced by combining either the GRPH or CODE key with the conventional keys previously described.

The NUM (number) key serves a special purpose. If pressed, it will stay down and converts the ten keys above it into a miniature numeric keypad. These keys are clearly identified by the small black number on a white square in the lower right-hand corner of the keytop. While the NUM key is in this mode, numerical data entry can be speeded up by using these keys as you would a calculator or adding machine's. Pressing the NUM key again disables this feature and the ten keys revert to their conventional function on the QWERTY keyboard.

The DEL/BKSP key is the last of the full-sized keys that requires description. It is located in the upper right-hand corner of the keyboard (just below the cursor control keys) and serves double duty. You may have already discovered that the backspace key acts as your electronic eraser. Each stroke causes the cursor to back up one space and "eat" the character that was in its path. This handy correction feature is available at all times and in all program modes. Either SHIFT key changes this into a DELeTe key that pulls characters on the display in from the right rather than moving the cursor to the left as does the backspace key. This function is only operative, however, in the TEXT mode when creating or editing documents. At other times, it simply acts as does the backspace

key. The combination of both the shifted and unshifted use of this single key lets you do most any editing task quickly and efficiently.

Programmable Function Keys

Located just beneath the LCD display are the eight programmable function keys (Figure 1-12). These keys have different meanings depending upon which application program you have selected. The Model 100, as witnessed by the listing of files on the Main Menu display, offers five choices. Each of these are discussed fully in the chapters ahead. Figure 1-13 enumerates the functions performed by each of these keys under each of these program selections. In addition, these keys can be redefined when the machine is operating in BASIC. This feature enables you to program as many as eight different actions that a user may select by merely pressing one

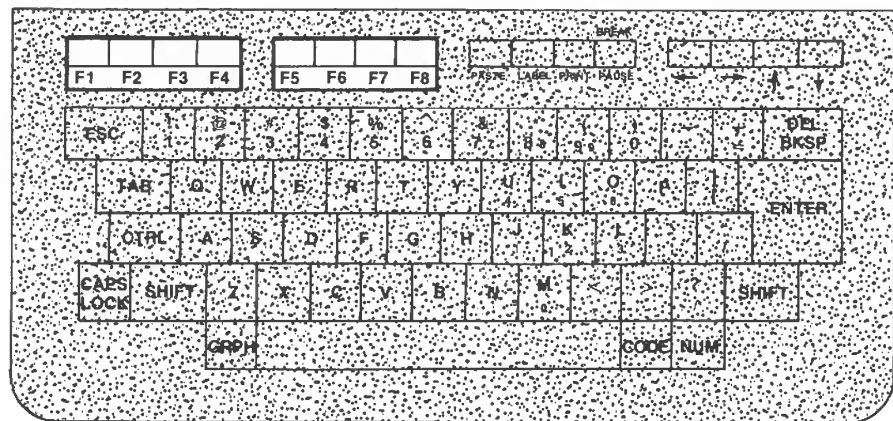


Figure 1.12 The programmable function keys

Program	F1	F2	F3	F4	F5	F6	F7	F8
BASIC	Files	Load	Save	Run	List	—	—	Menu
TEXT	Find	Load	Save	—	Copy	Cut	Sel	Menu
TELCOM	Find	Call	Stat	Term	Echo	Wait	—	Menu
ADDRSS	Find	—	—	—	Lfnd	—	—	Menu
SCHEDL	Find	—	—	—	Lfnd	—	—	Menu

Figure 1.13 Function keys definitions

of the function keys. Chapter 9, which deals with BASIC programming, explains how this is accomplished. Note that function key 8 (F8) is reserved as the "Menu" key. Regardless of the application mode you have selected, this key, when pressed, will terminate activity, preserve any files you may have created and return you to the Main Menu.

The Command Keys

Just to the right of the eight programmable function keys is located another group of four that serve as special "command" keys (see Figure 1-14). Each in turn is labelled as to its purpose. The first of these is the "PASTE" key. It is operational only when the machine has been selected by you to be in the TEXT mode. Used in conjunction with the "Cut" function, PASTE allows text to be manipulated during document editing. This feature is fully explained in Chapter 10 which is dedicated to the TEXT word processor application.

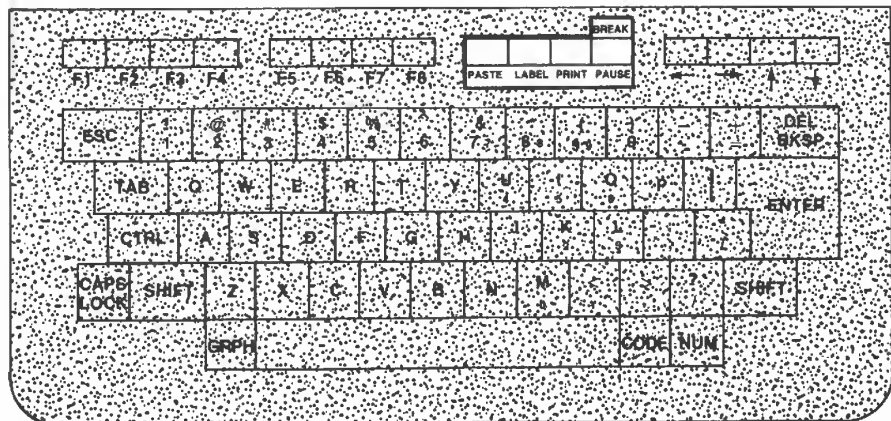


Figure 1.14 The command keys

The LABEL key is used to alternately display on the bottom line of the screen the operations performed by the eight programmable function keys. As you move from application to application, the function keys (as explained previously) take on different definitions. You need only press the LABEL key to see the current definitions for these keys.

Pressing it again removes this information and permits the last display line to be used for other purposes.

The PRINT key functions at all times and under all applications. When pressed, it causes the current screen display to be sent to your printer. Used in conjunction with the SHIFT key, it will print out an entire BASIC or TEXT file. If you press the PRINT key and your printer is inoperative the computer will stall. You can terminate the printing command by pressing the SHIFT/BREAK combination. While some printers will reproduce the graphic symbols that may have been created on the screen, others will either ignore them or behave peculiarly when these characters are encountered. Erratic performance of your printer can be halted by using the SHIFT/BREAK keys. Other means exist for sending information from the computer to the printer and will be discussed in future chapters. The proper connections to make to your printer are discussed in chapter 5.

The last command key is labelled BREAK/PAUSE. If pressed while a BASIC program is being listed or run, it will halt the machine until it is pressed again. This is most useful in that it allows you to momentarily stop a display that would otherwise scroll off the top of the screen. If pressed in combination with the SHIFT key, a BASIC program will be stopped. Only a CONTinue command or a new RUN command will start the program again. This SHIFT/BREAK combination is used in other applications as well and serves to abort whatever operation may have been started. As mentioned in the previous paragraph, it is the method by which a PRINT command can be rescinded and control of the Model 100 returned to the operator.

Cursor Control

The last keys to be identified are the cursor control group located in the upper right-hand corner of the keyboard (Figure 1-15). As the arrows beneath them indicate, they are used to move the blinking square (cursor) over the face of the Liquid Crystal Display. They are most used during word processing but also serve to move the selector bar across the screen of the Main Menu. Used in conjunction with both the

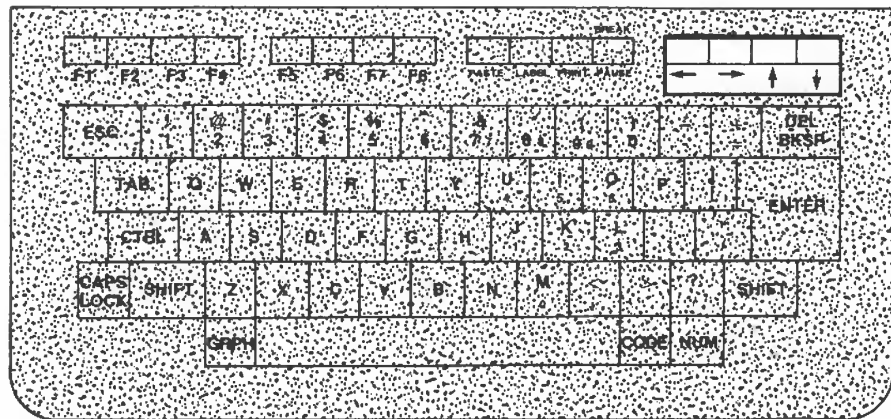


Figure 1.15 The cursor keys



Figure 1.16 The low battery indicator

CTRL and SHIFT keys, they perform special functions in the TEXT mode.

Other than the screen display, the only remaining item of interest on the face of the TRS-80 Model 100 is the LOW BATTERY indicator (see Figure 1-16). When this LED (light emitting diode) lights up, you should replace the four AA batteries immediately. There is a reserve of about 20 minutes of operation before the computer will cease functioning. Of course, if you have an AC adapter then power is always available and no such indication will be given.

Summary

Our survey of the keyboard is complete. All 72 keys have been discussed and we are ready to move on to some productive activity on the machine. A further exploration and demonstration of all of the applications of the TRS-80 Model 100 is part of the chapters that follow.

CHAPTER 2 Observing the Screen Characteristics

THE LIQUID CRYSTAL DISPLAY

In Chapter 1 we toured the Model 100's keyboard which comprises nearly two-thirds of its working surface. The remainder of the face of the machine is devoted to its unusual display which utilizes the technology of liquid crystals (Figure 2-1). While displays of this sort are not new (they have been a major component of almost every hand-held calculator produced in the last decade) it has only been since the advent of this machine that the display size has reached such proportions. The usable face of the display measures two inches by seven and a half inches and thus has room to show eight lines of 40 characters each. Each character is, in reality, comprised of many points that form the character desired (Figure 2-2). This dot-matrix concept is not unlike that which is employed

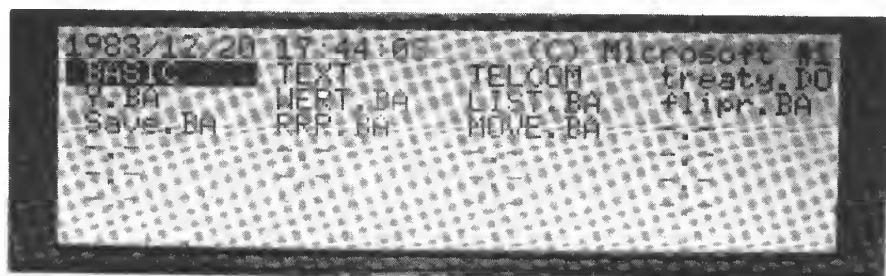
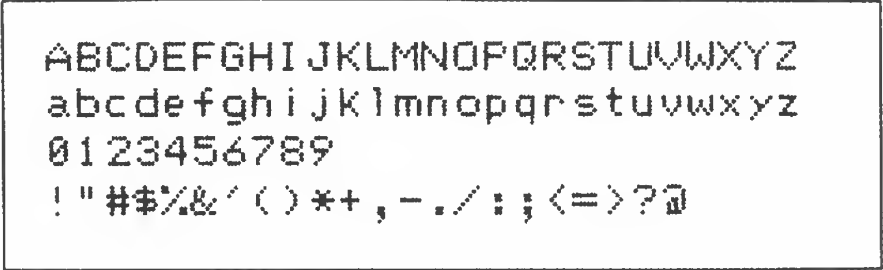


Figure 2.1 The liquid crystal display (LCD)



```
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789
!"#$%&'()*+,-./:;<=>?@
```

Figure 2.2 The TRS—80 MODEL 100 Character Set

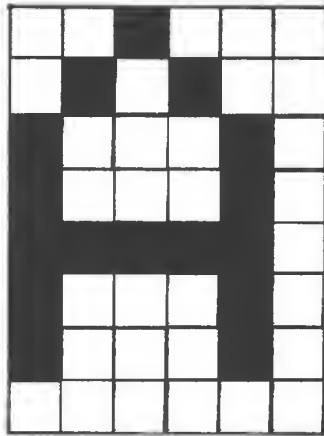
in the more popular high-speed printers; companions of such machines as this. A further understanding of some of the technical aspects of the LCD (liquid-crystal display) may help in your appreciation of the TRS-80 Model 100 as well as aiding in some of your programming efforts.

The Nature of LCD'S

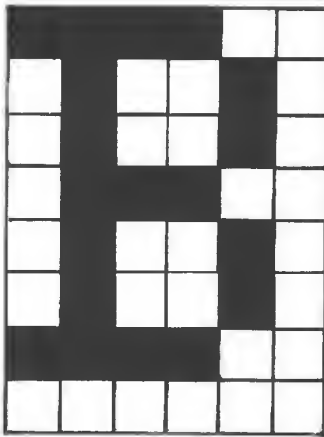
Liquid crystals are substances whose molecular structure changes in the presence of an electric field. By controlling the cells of the display at various locations, it is possible to form letters, numbers and other symbols. A liquid crystal scatters light that shines on it and is not a source of light itself. Unlike the more common TV type of cathode-ray tube display, the liquid crystal display can only function in the presence of extraneous light—the more, the better. The contrast level of an LCD can be adjusted by altering the voltage across it. This has the effect of changing the viewing angle as well. Though the TRS-80 Model 100 has a slight sloping angle to its face to provide easy viewing, this contrast adjusting feature was added to accomodate other working positions of the unit.

Size and Resolution

The Model 100 can display eight rows of 40 characters each. Each such character occupies a cell made up of a six by eight matrix of individual dots (Figure 2-3). These "dot" locations are more accurately identified as *pixels* (picture elements), a term peculiar to computer graphic displays. In the TRS-80



A



B

Figure 2.3 Typical pixel arrangement for creating alpha-numeric characters

Model 100, each pixel can be individually addressed and either turned *on* or *off*. This is accomplished from within BASIC, the high-level programming language built into the machine. A simple demonstration of this capability can be accomplished in the following manner:

1. With the cursor positioned over the word BASIC on the Main Menu, press <enter>.
2. Type in the following: (all in one line)
`10 CLS:FOR Y=0 TO 3:FOR X=0 TO 215:
PSET(X+Y*8,X MOD 31+18):NEXT X,Y <enter>`
3. Press the F4 key (**RUN**). Diagonal lines will form a pattern.
4. Press the F3 key (**SAVE**) and type in PIXEL <enter>.

Repeated pressings of the F4 key will re-run this simple demo program. The F8 key (Menu) will return you to the Main Menu where you will note a new file identified as PIXEL.BA on the display. You have just written (and saved) your first BASIC program. You can jump directly to this program any-time you wish by simply moving the Main Menu cursor over the filename "PIXEL.BA" and pressing the <enter> key. You can also KILL this file from memory by entering BASIC directly and issuing a KILL "PIXEL.BA" command (see Chapter 9).

We will explore this graphics capability further in the section dealing with BASIC programming. Each of these 15,360 pixels can be programmed to *light up* or *turn off*, creating some useful histograms and other geometric patterns.

Scrolling

Though the display has room for eight lines of text, the last line is typically reserved to indicate the purpose of the function keys or for certain relevant queries in response to your selections. Consequently, in normal operation while in BASIC, the display will *shift up* (or scroll), one line at a time, as new lines of information are added at the bottom. This

action can be inhibited, if desired, to prevent the screen display from disappearing from view. To best demonstrate this action, which may prove useful in your own programming efforts, do the following:

1. Enter BASIC from the Main Menu (press <enter> when the cursor is on the word BASIC).
2. The display will appear much as it does in Figure 2-4. The number of Bytes free depends upon the amount of memory your machine is equipped with and the number and size of files created.
3. Repeatedly press the <enter> key and watch the first few lines vanish off the top of the screen.
4. Type CLS <enter> to clear the screen and bring the word "OK" to the top of the screen.
5. Type: PRINT CHR\$(27)"V" <enter>. This is known as an *Escape Sequence* and causes the scrolling action to be inhibited.
6. You will now find that pressing the <enter> key will take you to the bottom line but no further and that the word "OK" can still be seen at the top of the screen.
7. The escape sequence, PRINT CHR\$(27)"W" <enter>, will reactivate the scrolling mode as will returning to the Main Menu by pressing F8 (exit BASIC).



Figure 2.4 The BASIC display

This demonstration of how to control scrolling not only serves to acquaint you with this feature, but with the concept of *escape sequences* in general. A complete table of these useful sequence commands appears in Appendix B.

Inverse Video

As the cursor of the Main Menu is moved from position to position, the various file names change from black characters against a white background to the opposite. This "inverse video" capability is a feature that you, too, can control and make use of. It is another of the *escape sequences* that is available in BASIC which can provide an attention-getting highlight capability. To demonstrate this action, take the following steps:

1. Enter BASIC
2. Type: `PRINT CHR$(27)"p" <enter>`.
3. Note that any typing will now produce clear characters against a black background. The same is true of messages echoed back by BASIC.
4. Type: `PRINT CHR$(27)"q" <enter>`. The normal video display has now been restored. It would also have returned to a normal state if you had exited BASIC (F8) and returned to the Main Menu.

Note: In the typing examples above, a question mark (?) serves as an acceptable substitute for the word PRINT. Typing `? CHR$(27)"p"` works just as well as the entry listed in step 2.

Summary

In this chapter you have learned that the liquid crystal display (LCD) is composed of over fifteen thousand programmable "pixels", each measuring approximately twenty-nine thousandths of an inch square. Taken as a block of six by eight, you

can create an infinite variety of symbols, or simply utilize the alpha-numeric characters and graphic symbols available from the keyboard. In addition, you can cause them to be displayed as black figures against a clear background or vice-versa. It is also possible to control the action of the display so that the normal scrolling action is inhibited and a "frozen" display can be programmed. This versatility, built in to the TRS-80 Model 100, is implemented from within the BASIC programming mode and provides opportunities for clever graphic displays — limited only by your skill and imagination.

CHAPTER 3 Communicating with the Outside World

INPUT/OUTPUT CONNECTIONS

Though the TRS-80 Model 100 is a marvel of self-contained technology, its finest feature is the ability to work with numerous external devices. This "pathway" to the outside world multiplies the machine's value considerably. The built-in word processing-program (TEXT) would lose its importance, for example, were it not for the Model 100's ability to send its contents to a printer. The sophisticated version of BASIC that resides in the machine would be meaningless if you were not able to record your programming on a cassette or floppy disk. Similarly, the telecommunications package (TELCOM) implemented in the machine is not feasible without a means to transmit over phone lines. All of these capabilities (and a few more) are contained within the architecture of the TRS-80 Model 100. In this chapter, we will continue our exploration by examining, one by one, the ways and means by which this computer "talks" to the rest of the world. As Figure 3-1 illustrates, these communication lines are available at the rear and left side of the machine in the form of various plugs and jack connections. Another communication line which will be found on the bottom of the computer, is identified as *External Bus Signal Connector*.

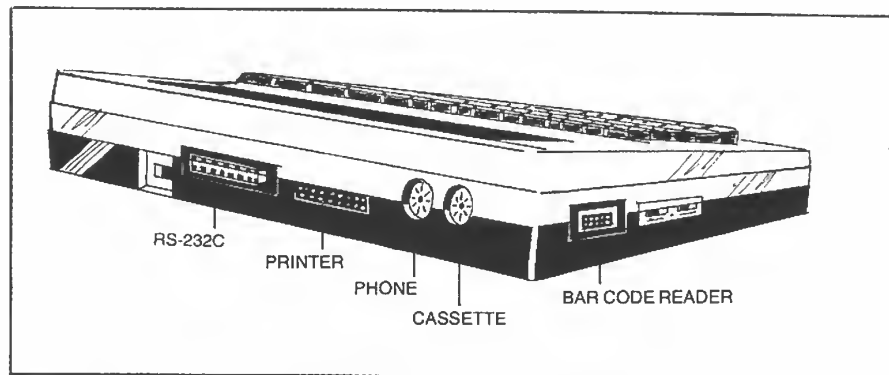


Figure 3.1 The TRS-80 MODEL 100 input/output connectors

Parallel Printer Port

Six different input or output connectors can be found at the back, side or bottom of the TRS-80 Model 100. Though the AC adapter plug-in is located on the side of the machine, it doesn't really qualify as an I/O (input/output) connector. Its job is much more mundane than the devices under discussion in this chapter.

One of the rectangular connectors at the rear of the Model 100 is labeled PRINTER and, as the name implies, is the means (but not the only one) for interfacing the computer with a hard copy printer (Figure 3-2). This 26 pin male connector is meant to accept the optional parallel printer cable (part number 26-1409). The cable terminates in a 36 pin Amphenol Blue Ribbon plug and is commonly identified as Centronics printer compatible. In an industry notably lacking in standards, this plug configuration is one of the more popular exceptions. Virtually all of the low and medium-priced printers on the market feature this Centronics parallel connection. It is generally not a problem, therefore, to correctly interface with a host of various printers.

The range of printers that can be used with the TRS-80 Model 100 extends from high-speed dot-matrix machines to relatively low-speed daisy wheel printers and typewriters. Radio Shack offers a rich variety of printers that mate with the Model 100 and any of their other computers. The model CGP-115 Color Graphics Printer they produce is a suitable companion to the Model 100 because of its low weight (1 3/4 pounds) and portability.

Parallel Printer Interface (Centronics)		
Pin No.	Symbol	Description
1	STROBE	Strobe pulse from Computer to printer.
2	GND	Ground
3	PDO	Bit 0 (1 sb) of output data byte
4	GND	Ground
5	PD1	bit 1 of output data byte
6	GND	Ground
7	PD2	Bit 2 of output data byte
8	GND	Ground
9	PD3	Bit 3 of output data byte
10	GND	Ground
11	PD4	Bit 4 of output data byte
12	GND	Ground
13	PD5	Bit 5 output data byte
14	GND	Ground
15	PD6	Bit 6 of output data byte
16	GND	Ground
17	PD7	Bit 7 of output data byte
18	GND	Ground
19	NC	
20	GND	Ground
21	BUSY	Input to Computer from Printer
22	GND	Ground
23	NC	
24	GND	Ground
25	BUSY	Input to Computer from Printer, high indicates device selected.
26	NC	

Figure 3.2 The parallel printer port

No special magic is necessary to successfully attach most printers to the TRS-80 Model 100. If the printer of your choice is Centronics compatible, and if you obtain the Radio Shack cable, the mating of the machine and printer is assured. Your printer may, or may not, require certain internal switch set-

tings of its own in order to provide proper operation, but that would be true regardless of the micro-computer you connected to it.

Once joined, the printer will respond to the PRINT command key (see chapter 1) as well as the LPRINT and LLIST functions that reside in BASIC. In addition, the printer functions under the command of various other programs and services available from outside sources. It is usually possible, for example, to have your printer echo the messages arriving on the Model 100's display from the numerous information services (CompuServe, Dow-Jones, etc.) as well as any of the free electronic "bulletin boards" that have proliferated throughout the country.

A direct, simple test of your printer can be accomplished by following these steps after the hook-up has been made:

1. Enter BASIC
2. Type all in one line:
`FOR X = 1 TO 5:LPRINT "The printer is working:":NEXT`
3. Press <enter>. The message should print out (with proper line feeds) five times.

If the paper doesn't advance after each line, check the switch settings as described in your printer manual. If the printer doesn't respond at all, the Model 100 is likely to "hang up" and can be brought back under control by pressing the SHIFT and BREAK keys simultaneously. Check all cable connections and make certain that the printer is in the "select" mode. Once started, printing can best be halted by using the SHIFT/BREAK combination.

RS-232C Serial Port

One of the other fortunate standards to gain acceptance in the computer industry is the RS-232C protocol for serial input/output connections. The title, RS-232C, is the number of the document that is written into the proceedings of the committee that created the standard on behalf of the electronic

engineering community. The term serial specifies that the flow of information proceeds like a train pulling one boxcar of data after another. This is the opposite of "parallel" which is analogous to eight trains moving simultaneously on parallel tracks. Either method delivers the data to the other end. Each method of information transmission has its advantages and disadvantages. Both are provided for on the TRS-80 Model 100. The previously described parallel printer port accommodates one method and the RS-232C connector provides the other.

Figure 3-3 portrays the location and pin connections of the RS-232C port. This 25 pin female connector will accept any of the DP25 plug cable assemblies available in most retail computer stores or from Radio Shack (part number 26-1408). Most commonly, this port is used for connection to a telephone modem if the internal modem of the Model 100 is not selected. *Modem* is an acronym which stands for "modulate-demodulate" and describes any device that acts as both the sending and receiving telephone interface for serially connected computers. Its principal task is to prepare the data for transmission over phone lines and, conversely, to take incoming data and make it presentable to the computer. Transmission can take place at different speeds and in various formats. The TRS-80 Model 100's internal modem is only capable of data transmission at a slow rate (300 BAUD - approximately 27 characters per second). Some external, commercially available, modems can transmit and receive at four times that rate and must be connected to the RS-232C port to be utilized by the Model 100. Radio Shack offers a two-speed modem (part number 76-1005) as do many other manufacturers. A further discussion of this configuration is covered in chapter 11 which deals with TELCOM, the telecommunications software resident in the TRS-80 Model 100.

Some printers provide for only a serial connection and do not observe the more popular Centronics parallel interface. The RS-232C port is the only means on the TRS-80 Model 100 to "talk" to such printers. One way of doing so is demonstrated as follows:

1. Obtain a cable that properly mates the Model 100 to your printer. The TRS-80 Model 100 requires a male 25 pin plug at its end. Your printer may be of either gender. Other connections may be required but be certain that pin 2 of

one end is wired to pin 3 of the other and vice-versa. These are the all important transmit/receive lines and must be crossed in this manner. Check your printer manual for other pin connections. One typical cable configuration is illustrated in Figure 3-4.

RS-232C Interface		
Pin No.	Symbol	Description
1	GND	
2	TXR	Transmit Data
3	RXR	Receive Data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	
8	NC	
9	NC	
10	NC	
11	NC	
12	NC	
13	NC	
14	NC	
15	NC	
16	NC	
17	NC	
18	NC	
19	NC	
20	DTR	Data terminal ready
21	NC	
22	NC	
23	NC	
24	NC	
25	NC	

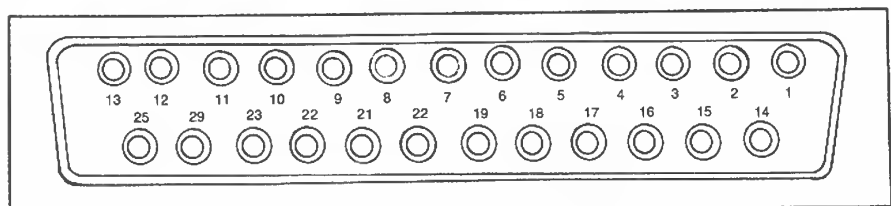


Figure 3.3 The RS-232C serial port

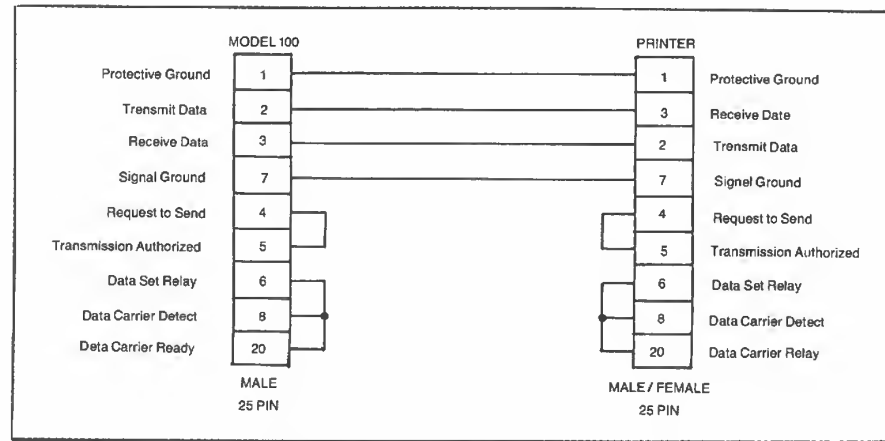


Figure 3.4 Typical RS-232C serial printer cable connections

- Set your printer protocols by whatever means is provided. Typically, this is accomplished by adjusting a number of "dip-switch" positions. One common arrangement is to set both the Model 100 and your printer for a transmission speed of 4800 baud (bits/per/second), Even parity, a 7 bit word length and 1 stop bit.
- Prepare a DO file (see chapter 10—dealing with TEXT).
- Enter TELCOM and press F3 (Stat). Type: 77EID <enter> Press F4 (Term) and then press F3 (Up). Respond to the file name request with the DO file you wish to send to the printer.
- Respond to the Width question with the number of characters you want across the page. Your document should print out when you press the <enter> key.

In addition to modems and printers, a host of other peripherals may become available that will normally interface to the RS-232C connector. Joysticks, plotters and light-pens are possible devices that may, in time, be developed to work with the TRS-80 Model 100. It would not be unexpected that they will "plug in" to this universal port.

Bar Code Reader Jack

The 9 pin Bar Code Reader jack is located on the left side of the TRS-80 Model 100 (Figure 3-5). As its name implies, it is reserved for use with an optional bar code reader (part number 26-1183). Further mention of this device, the software available to operate it and the purposes to which it can be applied appears in chapter 8.

Bar Code Reader		
Pin No.	Symbol	Description
1	NC	
2	R x DB	Receive data from bar code reader
3	NC	
4	NC	
5	GND	Ground
6	NC	
7	GND	Ground
8	NC	
9	VDD	

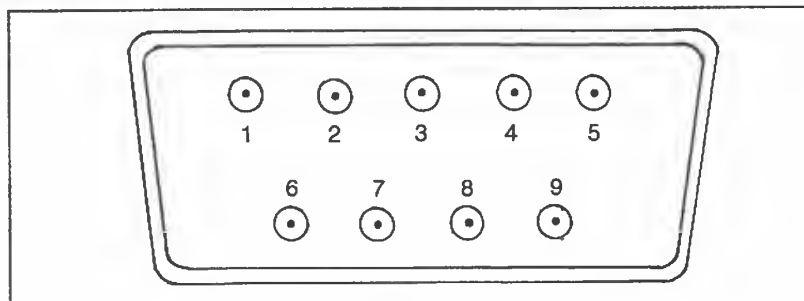


Figure 3.5 The bar code reader port

Cassette Interface

The 8 pin DIN connector is located in the rear right hand corner of the Model 100 (Figure 3-6). This connector mates with the optional cassette cable (part number 26-1207). The operation and functions of the cassette recorder are covered in the following chapter.

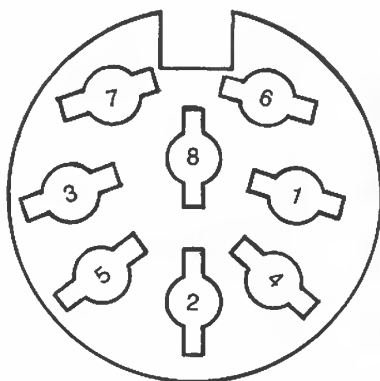


Figure 3.6 The cassette port

Cassette Interface		
Pin No.	Symbol	Description
1	REM 1	Remote
2	GND	
3	REM 2	Remote
4	R x C	Receive data for CMT
5	T x C	Transmit data for CMT
6	GND	GND
7	NC	
8	NC	

Input Level: Impedance 100ohm(800,mV-5Vpp)

Output Level: Impedance 3.3Kohm (650m Vpp)

REMote: 6 VDC 0.5A max.

Phone Output

Another 8 pin DIN connector of a slightly different style (Figure 3-7) is located just to the left of the Cassette Interface plug. Either one of two available cable assemblies are intended to be used here. Preferably, the direct Modem Cable (part number 26-1410) gives the best results but an alternative Acoustic Coupler assembly (part number 26-3805) is used under non-standard conditions. The operation of this equipment is explored in detail in chapter 11 which deals with TELCOM, the resident communication software package.

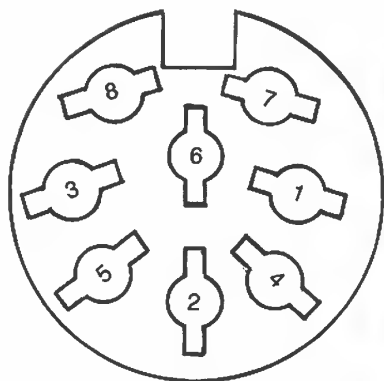


Figure 3.7 The telephone port

Modem Interface		
Pin No.	Symbol	Description
1	TL	Conventional Telephone Unit
2	GND	Logic GND
3	R x MD	Direct Connection to Tel Line (RING)
4	R x MC	Acoustic Coupler Connection (MIC)
5	T x MC	Acoustic Coupler Connection (Speaker)
6	VDD	
7	T x MD	Direct Connection to Tel Line (TIP)
8	RP	Ringing Pulse

Associated with the phone connector are two switches located along the left side of the unit. The DIR/ACP switch is placed in the DIR (direct) position if the direct Modem Cable described above is used. Conversely, it is switched to the ACP (acoustic cup) position if the Acoustic Coupler assembly is utilized. The other switch is labeled ANS/ORIG and is positioned depending upon whether you are answering or originating a telecommunication link-up. The proper selection of these switches is explained more fully in the TELCOM section in chapter 11.

The External Bus Signal Port

The last input/output interface available on the TRS-80 Model 100 is the External Bus Signal Port. It is located on the bottom of the unit beneath a plastic pry-off lid. When opened, this compartment reveals a 28 pin connector for an additional ROM (Read-Only Memory) device and a 40 pin socket that serves as the External Bus Signal Port (Figure 3-8). This receptacle provides direct access to the Model 100's memory address bus so that other types of peripherals can be interfaced with it. The most notable such accessory is Radio Shack's own Disk/Video Interface. This add-on expands the Model 100 enormously by providing both an on-line floppy disk storage unit and an output to a video monitor or standard television set. This sophisticated unit is explored in detail in chapter 7.

The signals that are present at the External Bus Signal Port constitute all of the major bus lines of the TRS-80 Model 100. It is likely that in addition to Radio Shack's own peripherals, other enterprising equipment manufacturers will soon offer devices that plug in to this access interface.

Summary

In this chapter, we have covered a physical and operational explanation of the various Input/Output connections. It is through these interfaces that the real power of the Model 100

can be realized. Hopefully this acquaintanceship will aid you in the discussions that follow, as well as suggest ideas for applications beyond what is presently offered.

40 Pin External Bus Signal			
Pin No.	Signal	Pin No.	Signal
1	VDD	40	VDD
2	GND	39	GND
3	AD0	38	AD1
4	AD2	37	AD3
5	AD4	36	AD5
6	AD6	35	AD7
7	A8	34	A9
8	A10	33	A11
9	A12	32	A13
10	A14	31	A15
11	GND	30	GND
12	RD	29	WR
13	10/M	28	S0
14	ALE	27	S1
16	CLK	26	CE for I/O Cont.
16	RD + WR	25	RESET out
17	INTA	24	INTA
18	GND	23	GND
19	RAM RAM RESET	22	NC
20	NC	21	NC

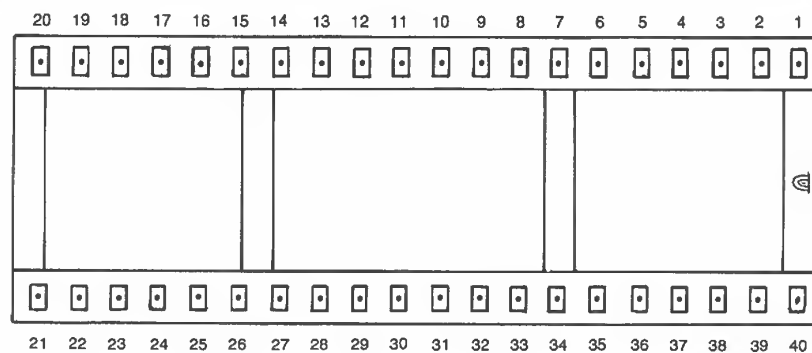


Figure 3.8 The external bus signal

CHAPTER 4 Using External Tape Storage

USE OF THE CASSETTE

The TRS-80 Model 100 is sold with 8K (8,192 units) of RAM (Random Access Memory) installed. This blank internal memory can be expanded by the addition of more integrated circuit chips (part number 26-3816). In total, the machine can be upgraded to hold 32K of user-available memory. Each unit of memory is equivalent to one character of text, thus the word "HELLO" utilizes 5 units (bytes) of machine memory.

While nearly 33,000 memory cells would seem sufficient for all practical purposes, it inevitably falls short at some point during your work with the Model 100. As you accumulate a library of useful programs, you will discover that the machine simply cannot hold them all in storage at the same time. Also, the documents you create, if not purged from memory, will rapidly exhaust the capacity of the computer. The practical solution to this memory inventory problem lies in the use of a cassette recorder.

An external tape recorder provides a means for transferring information into, and out of, the TRS-80 Model 100. Many programs have been written for this computer and are available both from Radio Shack and from "third-party" software publishers on cassettes. A simple means exists for loading your machine with these programs. Similarly, when it becomes necessary to delete files from the computer's internal memory to make room for other data, the cassette recorder becomes the storage bank that can receive and retain this information. This provision for shuffling information

back and forth is essential to the performance of the TRS-80 Model 100.

Cassette Choices

Radio Shack offers a mating CCR-81 Computer Recorder (part number 26-1208) which includes the Recorder-to-Computer cable (part number 26-1207) for use with the TRS-80 Model 100 (Figure 4-1). In fact, a variety of inexpensive tape recorders on the market will do the job very nicely. Ironically, the cheapest recorders work the best since elaborate tone controls tend to distort the data signals that pass between the recorder and the computer. Any recorder you select need only have a microphone input, an earplug output and a volume control. A remote jack (sometimes referred to as an auxillary jack) and a tape counter are valuable features, but they are not essential to the unit's operation for this purpose. It is necessary, however, to use the proper Radio Shack cable mentioned above.

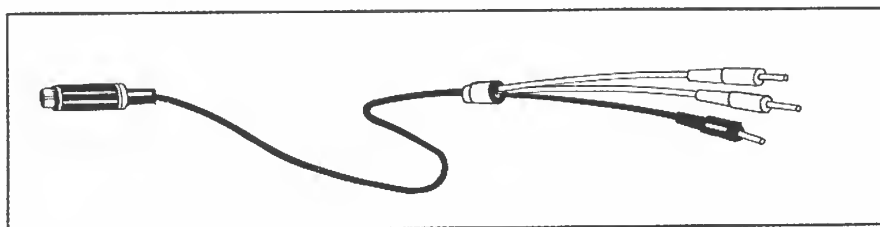


Figure 4.1 CCR-81 Recorder-to-computer connection cable

RECORD/ERASE /PLAYBACK

In operation, the cassette recorder is connected to the TRS-80 Model 100 by means of the 26-1207 Recorder-to-Computer cable. At one end, it features a round 8 pin DIN plug that mates with the female cassette connector on the rear of the computer (see Chapter 3). Make certain that the notch on the end of this connector is pointing upwards (Figure 4-2). The other end of this cable assembly terminates in three separate, mini-

ature plugs which are color-coded. The black plug is inserted in the cassette recorder's earphone jack and passes information out of the recorder to the computer. The large-tipped gray plug mates with the recorder's microphone jack and is the line over which information flows into the recorder. Some recorders use the phrase CMT IN, AUX or MIC to identify the input and CMT OUT or EAR to label the output. The small-tipped gray plug is used to send a signal to the recorder to start and stop its motor. This conveniently permits the computer to remotely control the tape movement. If used, the small-tipped gray plug is connected to the recorder's REMOTE jack. Not all cassette recorders feature this input. In the absence of this remote control capability, you can manually start and stop the action rather than depending on the Model 100.

While not overly critical, attention must be paid to the proper volume setting on the cassette recorder. Start by adjusting the control to its approximate mid-range. When a successful **Load** or **Save** has been accomplished, you may not need to move this control again. To best demonstrate the use of the cassette recorder with the TRS-80 Model 100, perform the following steps:

1. Connect the Computer-to-Recorder cable between the Cassette port at the rear of the Model 100 and your recorder.
2. Enter BASIC, press F2 and type: `PIXEL <enter>`. This refers to the one-line program we saved from our example

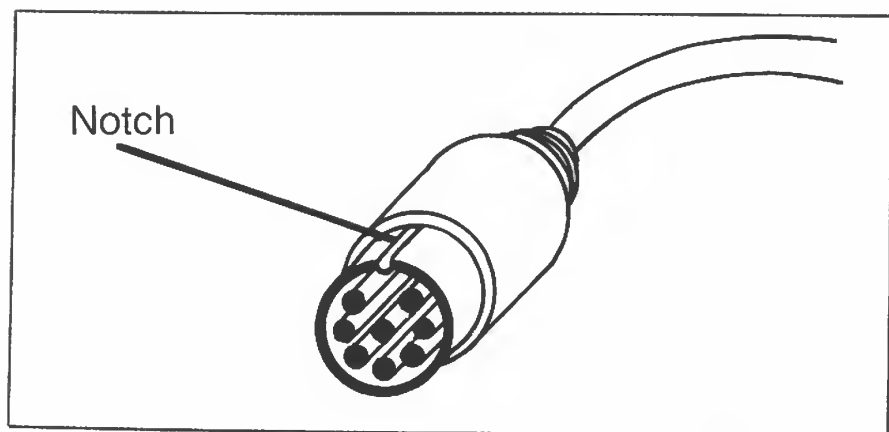


Figure 4.2 Cassette cable polarizing notch

in chapter 2. If present, this program will load in to BASIC. If the message, ?FF Error appears you have not previously saved the PIXEL program. Go back and do so now.

3. Place a fresh blank data tape (such as Radio Shack part number 26-301) in the recorder and REWIND it to the beginning. Advance the tape a short distance (if your recorder is equipped with a counter, then zero it and advance the tape to a reading of 10). This is necessary in order to go past the blank leader that most cassettes have at both ends of the tape. No recording can take place on this clear material. The Radio Shack tapes are "leaderless" and this precaution is not necessary.
4. Type: CSAVE "PIXEL.BA ". Press the RECORD and PLAY buttons on the recorder at the same time. Then press the <enter> key on the computer. If the REM plug on the cable was utilized, the Model 100 will automatically start (and stop) the recorder at the proper time.
5. When the Model 100's display says, "OK ", the tape recording of the PIXEL program has been made. If the REM plug was used, the recorder will stop. If not, then press the recorder's STOP key.
6. Rewind the tape to the beginning.
7. Type: NEW <enter>. This temporarily erases the PIXEL program that you loaded into BASIC. If you type RUN, nothing will happen, indicating that no program is presently in memory for BASIC to use.
8. Type: CLOAD "PIXEL.BA " <enter>. Press the PLAY key on the recorder. After a short time you will hear a raspy sound indicating that the recording you just made is being played back into the Model 100. This is followed by the message "Found: PIXEL ".
9. When the display says, "OK ", then the playback is complete. Typing RUN will execute our brief demo program once again.

Other commands are available on the Model 100 that

permit you to save text documents created by using the built-in word processor program. This capability is described in detail in chapter 10 which furnishes instructions on all phases of the use of the TEXT application software.

It is desirable to "bulk erase" a cassette tape prior to using it for recording purposes. This will guarantee that there are no spurious signals on it that would be misinterpreted by the computer. Bulk tape erasers are generally available at Hi-Fi and Electronic Parts stores.

Speed and Performance

The transfer of information between the TRS-80 Model 100 and the cassette recorder takes place at the rate of 136 characters per second. This relatively slow pace is necessitated by the rate of tape movement in the recorder, and the need to read and record with high reliability. If higher transfer rates were used, the chances of a missed bit of data would increase. While this would only cause a minor stutter in a violin passage, it is catastrophic in a computer system that depends on every element of information to be correct. You might be interested in hearing how this "computer talk" sounds. Simply pull out the EAR plug connector from the recorder while doing a **CLOAD**. The chatter coming from your recorder's speaker is what the Model 100 listens to. At a speed of 136 characters per second, a program file that contains 2K (2,048) individual characters (bytes) of information takes about 15 seconds to load in. While this does not compare favorably with the speed and versatility of floppy disk storage, it is acceptable considering its low cost and ease of operation.

It should be noted that, unfortunately, there is no compatibility between cassettes recorded for the Model 100 and the NEC PC-8201A or other similar machines. Each company selected a different format of tape recording, and tapes made on one machine will not play on the other. Be certain to mention the TRS-80 Model 100 by name when ordering software from advertised suppliers such as those mentioned in chapter 14.

Maintenance

From time to time, it is advisable to clean the recording and playback heads of your cassette recorder. There are any number of prescribed methods for doing that safely and efficiently. Perhaps the best method is to use a special head-cleaning cassette, sold in most audio supply stores. Instructions in the use of such a device are usually packed along with the special cleaning fluids that work best. Oxide from the tape will build up on the heads over a period of time and reduce (and distort) the output signal. When you cannot achieve satisfactory **CSAVES** and **CLOADS** from the computer, it is time to clean and/or recondition the recorder. The interconnecting cable is much less likely to be a problem, but it is wise to check it for damage should the system become totally inoperative.

Summary

This chapter described the means by which data files and program material may be stored and then re-entered into the TRS-80 Model 100. Without this capability, the machine would be seriously impaired in its usefulness to you. Fortunately, the cassette interface provides a low-cost, reliable, albeit slow method of information transfer. Other methods of off-line storage are discussed in chapters 7 and 14 but none is as cost-effective as the method described here.

CHAPTER 5 Working with the Printer

OFFERINGS FROM RADIO SHACK

Second only to the cassette recorder (or other method of external data storage), a printer is generally the most useful peripheral for any computer. Radio Shack is well aware of that and has produced numerous types of printers during their reign in the micro-computer industry. They have been very prolific in generating new models nearly as rapidly as Detroit retools their automobiles. Fortunately, they adopted the Centronics parallel interface concept which makes all of their printers compatible with virtually every other computer on the market as well as their own. The Model 100 is no exception and it requires only a printer cable (part number 26-1409) from them to interface any of their printers to the machine. Their line of printers ranges from low-cost, slow, minimal-featured machines to multi-thousand dollar, high-speed, letter-quality instruments.

Your choice, however, is not limited to the arsenal of printers offered by Radio Shack. More than 100 manufacturers, both in the United States and overseas, produce a broad spectrum of printers that include the radically new ink-jet and laser technologies. Since linking the TRS-80 Model 100 to a 150 pound, \$12,000, hi-tech device is akin to pulling a 45 foot Airstream house trailer with a Volkswagon, you will probably limit your choice to the small or modest sized (and priced) machines. Inevitably, the choice revolves around the speed and quality desired. Two different approaches to printer design have emerged to dominate the peripheral market: the dot-matrix and the Daisy-Wheel machines.

The Daisy-Wheel Printer

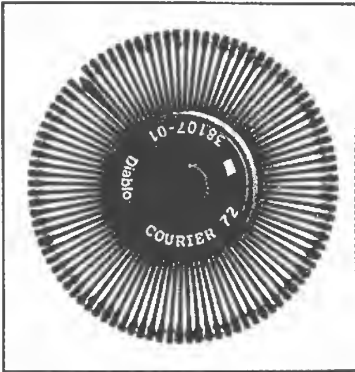


Figure 5.1 A "daisy-wheel" printing element

If serious word processing is your principal goal, then the daisy wheel printer should be your first choice. This family of machines derive their name from the use of a slip-in, plastic printing element shaped somewhat like a daisy with many petals (Figure 5-1). In operation, a letter is formed on paper by the action of a hammer striking the back of a petal and pushing it onto an inked ribbon and forcing that onto the paper. The daisy wheel is swiftly rotated (on command from the computer) to bring up the selected character just prior to this operation. As with any electro-mechanical device, there are advantages and disadvantages associated with the design. On the plus side, any daisy wheel printer far outperforms other machines in producing letter-quality output. Also, a wide selection of easily replaceable wheels adds to the versatility of the machine by permitting different font styles to be used to gain various effects. Substituting Gothic characters for Italics is simply a matter of switching daisy wheel elements.

The negatives associated with daisy wheel printers are price, speed and maintenance. This family of printers, in general, will initially cost two to four times as much as other types of machines you might choose. They typically contain more parts and are constructed with great precision to tight tolerances. Slow speed is another draw-back to the daisy wheel. While other types of printers will whiz along at 80 to 200 characters per second, the best output obtainable from a daisy wheel is approximately 45 to 55 cps. Most often, 12 to 18 characters per second is all that can be expected from the less expensive machines. A variation of the daisy wheel is manufactured by NEC (Nippon Electric Corporation) of Japan. It is identified as the *Spinwriter* and features a thimble-shaped element (Figure 5-2) that might be likened to a daisy whose petals are "folded".

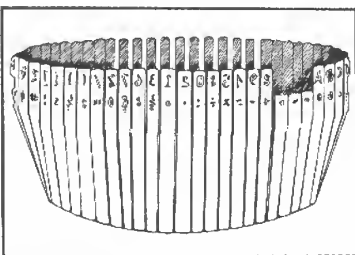


Figure 5.2 The NEC spinwriter "thimble" printing element

Maintenance costs are generally higher for a daisy wheel machine versus others because of the greater likelihood of failure and the higher associated costs of replacement parts. It should be noted, however, that the sturdier (albeit, more expensive) instruments, such as the *Spinwriter*, will perform faithfully without trouble, for long periods.

A new family of daisy wheel printers that are more right-

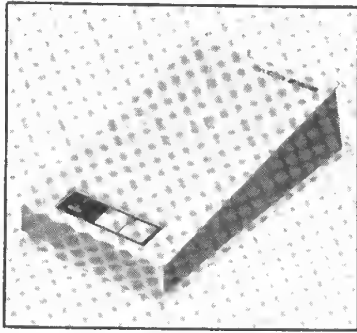


Figure 5.3 The brother IF-50 typewriter computer interface

fully called "computerized typewriters" have made their appearance in recent years. They are slow but low-cost, and feature a full keyboard that allows them to double as an office typewriter when not linked to a computer. These double-duty machines are an excellent choice for use in conjunction with the TRS-80 Model 100 by students or small business organizations. The cost advantage of having an off-line, full-featured electronic typewriter coupled with a computer-driven printer is not to be ignored. One such machine, the Brother CE-65 along with its companion IF-50 Computer Interface (Figure 5-3), is an excellent example of this new breed of typewriter/printer.

The Dot-Matrix Printer

The other principal type of printer available today is the dot-matrix machine. It derives its name from the action that is used to form the characters on paper. The printhead consists of a series of needles that push the inked ribbon against the paper under command of the computer and its own internal electronics. The result is that letters and numbers are formed as a series of closely spaced dots rather than as the action of a single element striking the paper. Because the set of needles are always ready to form successive characters, speed of operation is greatly improved over the daisy wheel. The initial cost of such printers is typically less, as well, and maintenance, consequently, is more reasonable. It is the letter-quality appearance of the finished printing that is sacrificed when selecting a dot matrix machine. Some newer models overcome this, however, by slowing down their output and printing twice as many dots to fill in the gaps in the formed characters. These "near" letter-quality machines are a suitable compromise if both speed and appearance are mutually important factors.

Summary

This chapter has covered the choices available to you in a companion printer for the TRS-80 Model 100. The selection will undoubtedly be made based on budget, speed and type of

performance required. The student may find the computer interfaceable typewriter to be the most versatile choice, while a journalist could settle for the draft quality of the "two-pass" dot-matrix machine. If the Model 100 is to be used mainly at home for personal computing, the low-cost, full-speed, dot-matrix machines are a wise option. Finally, the user who simply must have a "print-it-anywhere" device may opt for a small, battery-operated thermal printer such as NEC's model PC-8221A. Whatever your choice, be certain that the printer has a Centronics-compatible parallel input. This feature is necessary in order to mate with the TRS-80 Model 100 through the special cable offered by Radio Shack. As described in chapter 3, serial input/output operation to a printer is possible but generally too cumbersome to be used. Then too, such operation "steals" the valuable RS-232C port which is better used for other purposes described in coming chapters.

CHAPTER 6 Exploring the Options

AVAILABLE ACCESSORIES

Radio Shack supplies a complete line of accessories for the TRS-80 Model 100. These include extra memory chips, printers, a high-speed modem, software, cassette recorder, AC adapter, bar code reader, various cables and batteries. A most recent peripheral offered by them is the Disk/Video interface which is the subject of the next chapter. Appendix H lists these items in detail and provides factory specifications where relevant. While adding significantly to the cost of the system, these accessories extend the versatility and usefulness of the machine enormously. This chapter examines some of the more valuable optional equipment not previously discussed.

Add-On Memory

The TRS-80 Model 100 is delivered to the user with either 8K or 24K of random access memory (RAM) installed. In addition, 32K of read-only memory (ROM) is included in the machine and contains the operating system, BASIC and other routines. A provision is made for adding additional RAM or ROM should the user wish to expand or modify the capacity of the computer. At present, no ROM add-ons are available from Radio Shack or others, but most likely will surface as additional functions and peripherals are created. RAM is pres-

ently available from Radio Shack and other sources in the form of an 8K by 8 bit plug-in module. Sockets are provided inside the Model 100 to hold four of these memory modules. Depending upon the version of the machine you have purchased, either one or three of these sockets are occupied. Adding additional memory, to the limit of 32K, is simply a matter of filling any vacant sockets moving from right to left. The RAM chips are available from Radio Shack as part number 26-3816. It is suggested that the installation be done by Radio Shack personnel especially during the warranty period of your machine. After that time, you may elect to install the add-memory yourself (it's not that difficult) and to purchase it from other sources. If you elect to install these modules yourself, it is wise to purchase a copy of the TRS-80 Model 100 Technical Reference Manual from any Radio Shack store. It is filled with valuable, albeit highly technical, information about your machine. Sections 2 and 7 of that guide book explain (with illustrations) how to disassemble and reassemble the Model 100. Only four small screws hold the two halves of the unit together. It is a reasonably simple procedure to install extra memory following the steps described in those sections. A condensation of their instructions is listed here for your convenience.

Preliminary steps:

1. Save any important programs or files out onto cassette tape (see chapter 4).
2. Turn off the computer and set the Memory Power Switch to OFF.

To disassemble the computer:

1. Disconnect all cables from the unit (printer cables, cassette cables, etc.).
2. Turn the computer over and place it on a bath towel or other soft material to prevent scratching the display. Remove the four screws near the corners to separate the lower case (black area) from the upper case.
3. Turn the computer over again and remove the upper case, opening it to the right side. Note that the upper and lower

case are also held by snaps. You will need to pull the upper case firmly, but gently. The LCD, keyboard, and buzzer are connected to the CPU board in the lower case by a flat ribbon cable.

4. Plug in the additional memory modules in the sockets in the lower left hand corner of the lower case. Be careful of misaligned pins and be sure to bleed off any built up static that may exist on your hands. Orient the 8K Memory Module so that the notch on the module is pointing downwards the same as the modules originally inserted by the factory.

To reassemble the Model 100:

1. Carefully swing the upper case over the lower case. Avoid pulling on the connecting cables.
2. Align the upper and lower cases so that the tabs fit well. Snap the two halves together.
3. Hold both cases together, turn the machine over and secure with the original four screws.
4. Reactivate the Memory Battery Power by turning the Memory Power Switch to ON.

While the procedures outlined above are simple and should require no more than 15 minutes to perform, you are well advised to let Radio Shack personnel perform the memory module installation if you are concerned about voiding your Model 100 warranty or damaging your machine. If you decide to add to your computers capacity yourself, you should be aware that compatible memory modules units are generally advertised at lower than Radio Shack prices in various magazines (see "Accessories" and "Publications" listings in chapter 14). Remember that the Model 100 must be "powered down" before it can be opened in order to perform a memory transplant. It is necessary, therefore, to SAVE any valuable files you have out on tape before such an operation.

On initial power-up, before any files have been created by you, the Main Menu will identify the amount of available memory (RAM). This number appears in the lower right hand corner of the display (see Figure 6-1). Depending upon the

number of memory chips installed in your Model 100, the figure will be:

8K Machine - 5062

16K Machine - 13254

24K Machine - 21446

32K Machine - 29638

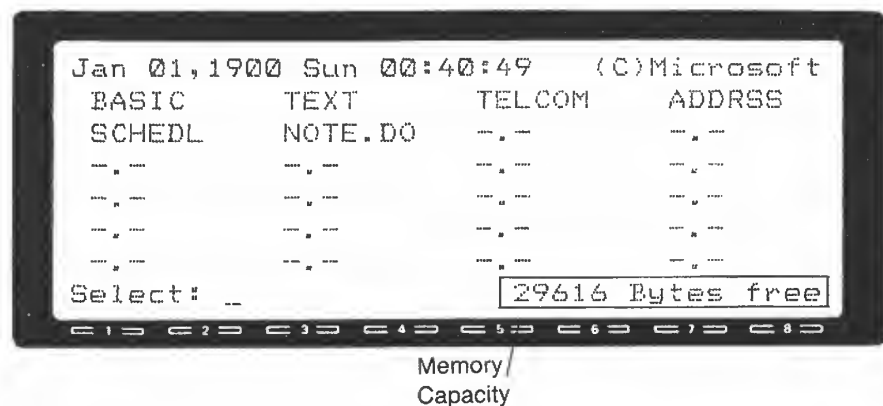


Figure 6.1 Main menu memory capacity display

High Speed Modem

As discussed in chapter 3, the RS-232C connector at the rear of the TRS-80 Model 100 provides an interface for telecommunications. While the built-in modem of the Model 100 is reliable and most useful, it is limited to a transmission speed of 300 Baud (bits-per-second). Although this 27 character per second rate is considerably faster than the swiftest of typists, it is agonizingly slow for the transmission of very long documents. A four-fold speed up is possible if a more sophisticated and more expensive modem is used. If you are considering using any of the information services (i.e. DOW-JONES, The Source, etc.) on a regular basis, then the investment in a 1200 Baud modem is worthwhile. These services usually allow contact to be made at either the more common 300 Baud or

1200. They charge more if you are using the 1200 Baud service, but since your communications take place four times faster, you net a reasonable savings in service charges.

Proper hook-up to your phone is essential but not complicated. Most cables supplied with modems permit uninterrupted use of the phone for normal purposes, and easy switch-over to data transmission. Some arrangements allow for the use of acoustical cups which fit over the mouthpiece and receiver of your telephone handset. This crude technique is to be avoided, if possible, because of the resultant deterioration of signal quality. Properly installed, it can work, however, and is mandatory when hooking up to public payphones or hotel-room instruments. In general, the majority of equipment sold today works reliably and is compatible with the TRS-80 Model 100. Telecommunications between your Model 100 and other computers throughout the country is simple to implement and dependable in operation.

Cassette Software from Radio Shack

Although the TRS-80 Model 100 contains some very useful built-in software, as described in Part 2 of this book, the machine would be limited in its purpose if you could not obtain other programs as well. In recognition of this, Radio Shack (and many others) offer a rich variety of useful software on cassette for the Model 100. The library at present consists of over 100 such packages with more being added every month. In addition, a wealth of free software is being created and distributed by users around the country. In chapter 14 we discuss the steps that can allow you to tap in to this underground material.

As they do in support of their other computers, Radio Shack offers various low-cost, well-documented programs for the Model 100. A brief list is included here for your reference.

Investment Analysis - 26-3824

Statistical Analysis - 26-3825

Plotter Control - 26-3834

Personal Finance - 26-3822

BASIC Language Lab - 26-3821

Executive Calender - 26-3833

Starblaze-100 - 26-3840

An even greater variety of titles is available from more than a dozen other software publishing houses. A brief mention of them and their products is contained in chapter 14 which summarizes goods and services available from sources other than Radio Shack.

Misc. Accessories

To round out the system requirements, Radio Shack also offers a variety of minor accessories specifically designed for the TRS-80 Model 100. One such item is the Compact Model 100 System Briefcase. It is made of durable plastic and is reasonably priced. It is not likely to be confused with a Gucci attache case or even a piece of quality Samsonite luggage but its appearance is secondary to its function. Compartments are included to house not only the Model 100 but also a cassette recorder, some cables and a few miscellaneous items.

The Model 100 Acoustic Coupler is the necessary accessory for users who cannot make direct connection to a telephone handset. The Direct-Connect Modem Cable, on the other hand, is precisely what is needed when one can tie in through a conventional modular phone jack. One of the choicest bonus packages that Radio Shack offers is the combination of the Modem Cable plus one free hour on both the CompuServe and Dow Jones information services. Unquestionably, any purchaser of the Model 100 should avail him or herself of this outstanding bargain. The complimentary time on these two major services will serve to introduce you quickly to the wonderful world of telecommunications. In chapter 14 we explore in detail the steps to take to obtain a free demonstration of CompuServe if you choose to obtain only the Modem cable.

Radio Shack rounds out their arsenal of accessories by

also offering the Parallel Printer cable mentioned previously in chapter 3. Though not specifically for the Model 100, they also sell printer ribbons, paper, blank cassettes and even the necessary AA size batteries your Model 100 eats up at the rate of four every 20 hours. An AC adapter alleviates that expense, however, and Radio Shack offers that item as well.

Summary

This chapter has introduced you to a number of options available from Radio Shack that serve to enhance the performance of the TRS-80 Model 100. The Model 100 should be considered a powerful central computer unit surrounded by numerous devices that can either increase its memory capacity, help it to store information or promote its contact with the outside world. Wisely, the unit was designed to provide for a host of as yet undeveloped accessories. Demand, coupled with technological advances, will dictate what new functions and services the machine will ultimately provide.



CHAPTER 7 Enhancing Storage and Display

THE DISK/VIDEO INTERFACE

While there are distinct advantages to owning a four pound, battery-operated, fully portable micro-computer, there are some drawbacks as well. It is necessary to sacrifice the convenience of a full size display if the machine is to have an overall size no greater than a notebook. Then too, floppy disk storage, with all its advantages, must be left out if the computer is to run on a few, light-weight, inexpensive batteries. Large displays and motor-driven peripherals are just not compatible with the concept of small size and portability. Fortunately, Radio Shack offers the Model 100 owner the option of adding both a larger, conventional display and floppy disk accessibility by the addition of their recently developed Disk/Video Interface (Figure 7-1).

The DVI (Disk/Video Interface) can be thought of as a "base-station" for the Model 100 to plug into. The computer is still free to be used as a truly portable machine but can be "upgraded", as desired, by merely making one cable connection to the DVI unit. Your Model 100 must have at least 16K of RAM (Random Access Memory) installed if it is to be used in conjunction with this device. The Disk/Video Interface is offered with one 5 1/4 inch, single-side, double-density floppy disk drive. Another may be added whenever you wish. The capacity of each individual diskette is approximately 180,000

characters, enough to fill up the Model 100 nearly six times over. The unit is 12 inches square and nearly 6 inches high and matches the Model 100 in both color and appearance. Connections are available at the rear for hook-up to both a conventional TV set and a monitor. While a monitor is preferable because of its higher resolution and clarity of performance, the television set serves reasonably well for most applications. If you desire a remote display, both the TV and monitor can be driven simultaneously. In addition to the customary, well prepared User's Manual and Reference Card that are the hallmark of Radio Shack products, the DVI includes an operating system diskette that is essential for the operation of the unit. A two foot long flat-ribbon cable that completes the connection between DVI and Model 100 is also part of the package. A TV hook-up cable and switch box are needed if a conventional television set is to be used and Radio Shack has thought to provide them as well. Even a small, plastic replacement lid for the pry-open cover on the bottom of the Model 100 is included. As a thoughtful and convenient design consideration, a special ZIF (zero-insertion-force) connector aids in the plug, unplug operation each time you take your Model 100 on the road.

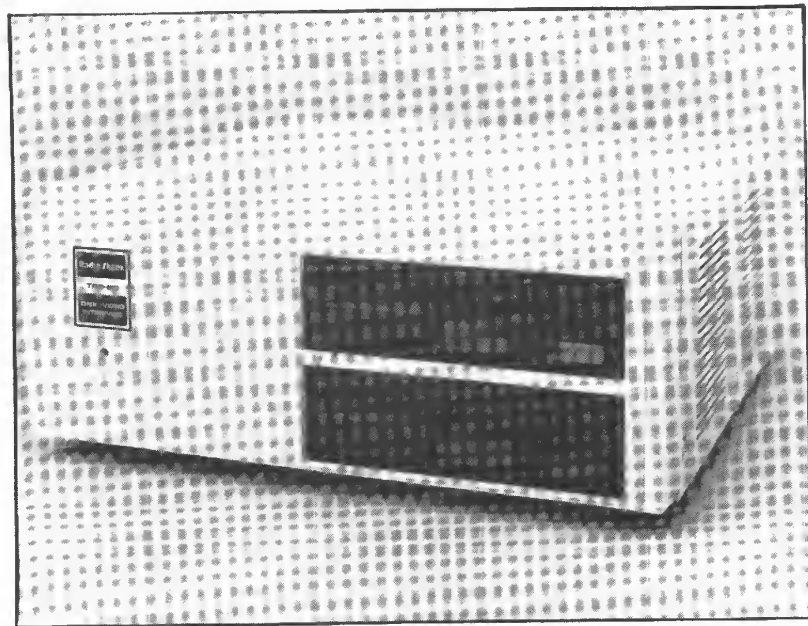


Figure 7.1 The disk/video interface

Though the Disk/Video Interface unit represents an investment rivalling the original cost of the TRS-80 Model 100, the added versatility and usefulness of the combination makes it a formidable accessory for dedicated Model 100 users.

Installation

After the Disk/Video Interface unit has been removed from its carton and set in a convenient location, the actual installation procedure is as follows:

1. Remove the ZIF (zero-insertion-force) adapter socket from the end of the flat-ribbon cable supplied with the Disk/Video Interface. This is accomplished by raising the lever that lies along one side of the socket.
2. Using the edge of a twenty-five cent piece, pry open the plastic compartment lid on the bottom of the Model 100. Two sockets can be seen, one longer than the other. Into the longest socket (the one farthest from the edge of the machine), carefully plug in the ZIF adapter socket that was removed from the end of the flat-ribbon cable. The end of the lever of the adapter socket should lie next to the white number 1 on the printed circuit board below.
3. With the lever raised, carefully plug the mating 40 pin male connector on the end of the flat-ribbon cable into the ZIF. The cable is oriented so that it rises to the top of the Model 100 and the red line on the flat-ribbon cable is nearest to the right-hand edge of the computer. Lower the lever and replace the compartment lid with the one supplied with the DVI. The ZIF adapter socket will always remain in your Model 100 and the DVI cable can be plugged in or removed by merely prying off the lid, raising the ZIF lever and removing the cable end.
4. Plug the other end of the flat-ribbon cable into the 40 pin socket on the bottom of the Disk/Video Interface. It is secured by latching the plastic hooks at each end in place over the connector (see Figure 7-2).

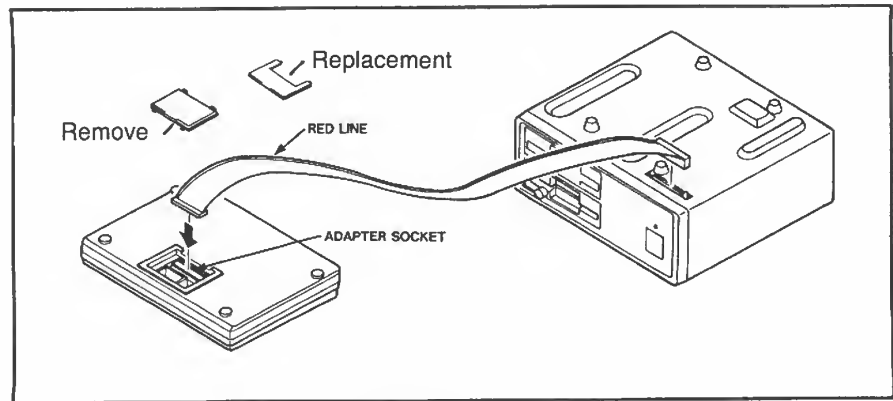


Figure 7.2 Connecting the MODEL 100 and disk/video interface

5. If a video monitor is being used, plug the supplied coax cable between the monitor input and the jack marked *To Monitor* on the rear of the Disk/Video Interface (see Figure 7-3).
6. If a television set is to be used as the display, plug the supplied coax cable between the jack marked *To TV* and the *Computer* connector of the supplied TV switch box. Other connections to the TV and the switch box are illustrated in

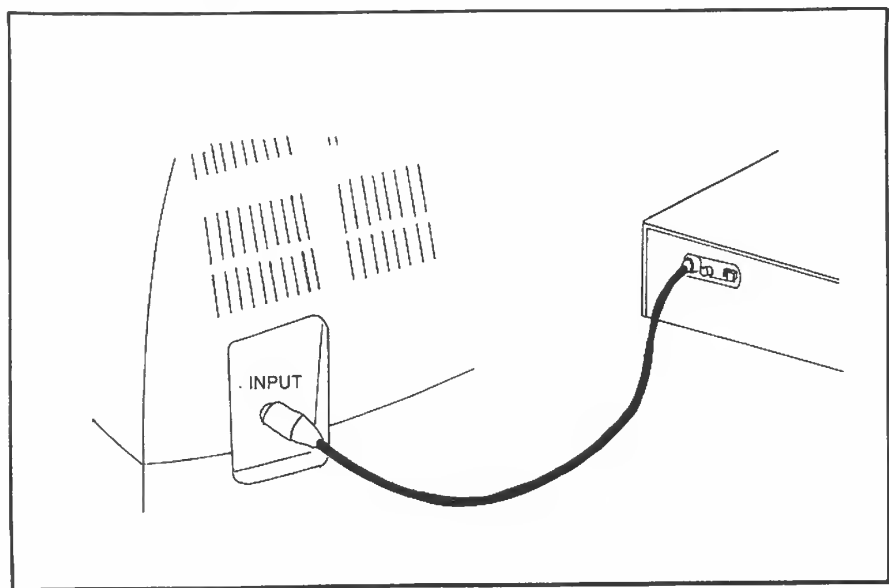


Figure 7.3 Connecting the disk/video interface to a monitor

Figure 7-4. Set the *Channel Select* switch on the back of the DVI to whichever channel is not being used by a broadcast station in your area. The TV set must be tuned to this channel (and the switch box set to COMPUTER) whenever the DVI is in use.

7. Making certain that the power switch on the back of the Disk/Video Interface is off (down to bottom of unit), plug in the DVI power cord.

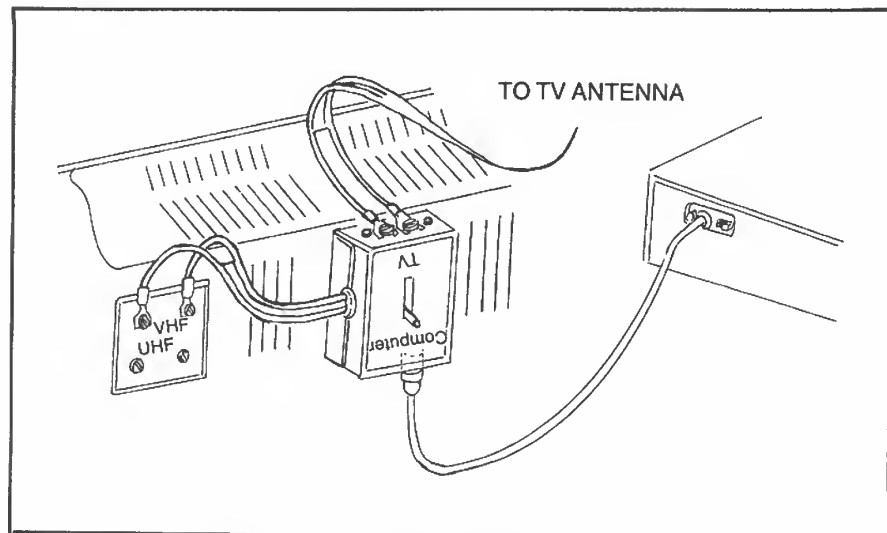


Figure 7.4 Connecting the disk/video interface to a television set

With everything connected as described, the total system is ready to be powered up. Start by turning on the Model 100. It must be the first unit ON and the last one OFF whenever you use it in conjunction with the Disk/Video Interface. Then turn on the DVI, the TV (or monitor) and any other peripherals you have connected, such as a printer. With the TRS-80 Model 100 now plugged in to the Disk/Video Interface, the message, "Please wait!" will appear on the video display followed shortly by, "Insert system diskette.". The indicator light is lit on disk drive number 0 (the upper one) verifying that all is well and that a diskette is anticipated for that drive. Insert the Radio Shack supplied diskette in the manner illustrated in Figure 7-5. Turning the disk drive clamp lever down will produce the brief message, "Getting ready"

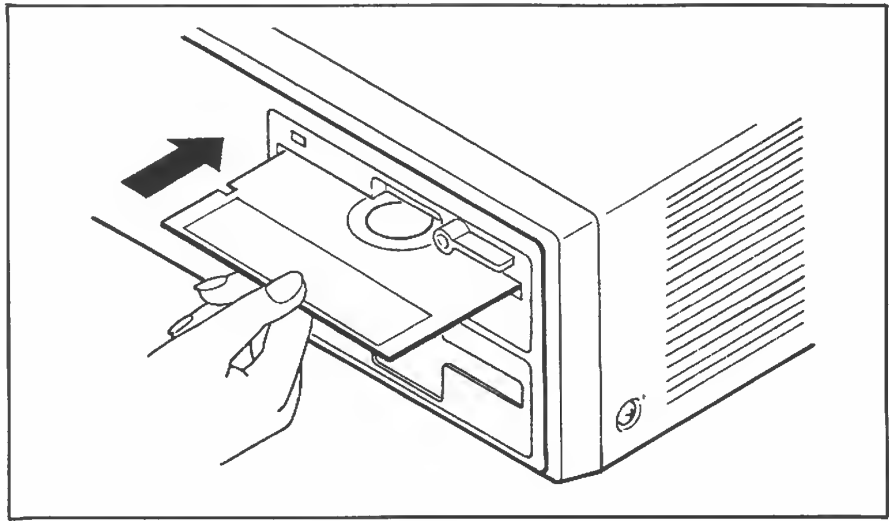


Figure 7.5 Inserting the system diskette

quickly followed by the opening credits for Microsoft Corp., the originators of both the Model 100 BASIC and the advanced disk BASIC for the DVI. The disk drive indicator light extinguishes and an impatient flashing cursor is awaiting your next command. The next step is to enter BASIC on the Model 100. Pressing <enter> is all that is required and the LCD display responds in the familiar manner. At this time, BASIC will address itself to the Model 100's screen only until commanded otherwise. Typing: `SCREEN 1,1 <enter>` will accomplish this changeover. If the TV (or Monitor) does not respond, pressing the Model 100's Reset button (located at the rear of the computer) will reactivate the DVI's disk drive. Retyping `SCREEN 1,1` should then switch output to the TV. From this point on, the total system is online with the Model 100 supplying the keyboard, the DVI supplying the floppy disk capability and the video monitor/TV responsible for display. The counteracting command, `SCREEN 0` will get you back onto the LCD display.

Operation

The video display is 25 lines from top to bottom, more than three times the capability of the built-in Liquid-crystal display of the TRS-80 Model 100. In addition, it is possible to portray

80 characters per line rather than the limited 40 of the LCD. The command, `WIDTH 80 <enter>` will instantly put the system into this mode. This is definitely not desirable if a conventional TV set is being used because the limited bandwidth of most television sets will cause "smearing" of the characters that reduces the display to illegibility. `WIDTH 40` is all that can be utilized and even that may cause poor displays on older color units. Conversely, a good quality black and white monitor can handle the `WIDTH 80` mode easily and the full display is a definite enhancement over the 8 line by 40 character Model 100 display. Word processing (using the `TEXT` program described in Chapter 10) is performed more efficiently with a full page display as can be obtained by using a monitor in the 80 mode. `TELCOM` too, (chapter 11) is more comfortable to work with, since incoming messages are neither truncated nor scrolled into oblivion as they are with the 8 by 40 LCD screen.

The systems diskette supplied by Radio Shack with the Disk/Video Interface contains utility software that enables you to prepare new diskettes for use in the machine. In addition, other routines allow you to copy your system diskette so as to provide you with an extra copy as security against damage. As Radio Shack's manual encourages, it is prudent to start by making a `BACKUP` of your system diskette and then putting the original away for safe-keeping. The steps to accomplish this are simple and only necessitate that you invoke the `FORMAT` command in order to prepare a fresh, blank diskette for further use. This is followed by initiating either the `BACKUP` or `BACKUP.SNG` function depending upon whether you have a single or double drive unit. In either case, both `FORMATting` and `BACKUP` go smoothly and easily by merely following the prompting messages that appear on the display.

The disk drives of the DVI become an extension of the Model 100's storage capability and are addressed as drive 0 and drive 1. As explained in chapter 10, which describes the operation of the `TEXT` program, you can both `SAVE` and `LOAD` document files to a cassette recorder. With the Disk/Video Interface unit installed, preceeding the filename with either 0: or 1: will direct the file to be saved (or loaded) to either of your disk drives instead. The same is true from within `BASIC`. Programs can be `SAVED` or `LOADED` to floppy disk by adding

the drive number ahead of the filename (i.e. SAVE "0:filename.BA"). Unfortunately, the format of the diskettes recorded with the DVI are not compatible with any other computer, not even Radio Shack's own model 4 which also uses the single-side, double-density format. Until such time as either Radio Shack or others offer software on disk for the Model 100, the DVI serves only to extend your off-line storage capability beyond that which a cassette recorder can do. Since, however, it reads and writes at a transfer speed of 32,000 characters per second it outperforms the recorder by a speed factor of 235.

The Disk BASIC that is supplied with the DVI adds a few new commands to the TRS-80 Model 100. Principally they are used for the creation of either sequential or pseudo-random files onto the disks. Those commands unique to the Disk/Video Interface are:

LFILES - displays the filenames on the disks. LFILES 1 is the proper command when the directory of drive #1 is desired. The last entry of the display will be a figure representing the remaining unused capacity on the disk.

SCREEN - though this is not a new command, it is expanded from its Model 100 definition and now serves to switch displays as well. The two parameters of this command perform as follows:

SCREEN 0,0 - LCD display - function key list off

SCREEN 0,1 - LCD display - function key list on

SCREEN 1,0 - DVI display - function key list off

SCREEN 1,1 - DVI display - function key list on

WIDTH - this command, followed by the number 40, sets the display (either LCD or DVI) to 40 characters per line. If a monitor is used in conjunction with the Disk/Video Interface and a command of SCREEN 1 has been issued then 80 characters will be displayed on each line.

DSKIS\$/DSKO\$ - these two complimentary commands are used to read or write (input or output) a string of data to a specific sector of a specific track of a specific drive. This structure permits a type of random access operation for which floppy disks are best noted. No less than 128 characters

may be stored or retrieved at one time, this being the smallest increment (one half of a sector) that Disk BASIC can manipulate. The usage of these commands is awkward by comparison with such functions as GET and PUT which are more commonly permitted in other disk operating systems. It is possible to use the DSKO\$ and DSKI\$ commands to achieve random record file storage but only if a rigid set of housekeeping rules are obeyed within the BASIC program.

PRINT #/INPUT # - this pair of commands, which are normally used for reading and writing individual data strings to the cassette recorder, are used to accomplish the same sort of sequential file maintenance on disk. As little as one character may be stored or retrieved, if desired. Just as with tape storage techniques, special programming rules must be observed in order to preserve separation between specific portions of data.

LOF - this new command returns the number of the last record in a file. After a file has been OPENed, LOF can be invoked to obtain the number of sectors used by that file. This is useful as part of the necessary record tracking required to use the random access procedures correctly.

LOC - this companion command returns the number of the most current record accessed. Its use also facilitates proper file structure maintenance if random access recording is implemented.

Five additional error codes are employed by Model 100 Disk BASIC beyond the 31 that are a part of Model 100 BASIC. All of them are listed in Appendix E at the back of this book.

Summary

This chapter has presented an overview of the specifications and operation of the Radio Shack Disk/Video Interface. While this peripheral does not make the Model 100 into a full-fledged business computer, it does considerably enhance its capabilities. By adding the speed and reliability of floppy disk operation it replaces the less suitable cassette recorder as the means for off-line storage. Its faster transfer rate of data, plus its greater capacity, add to the efficiency of the Model 100 well beyond that afforded by tape recording. Word process-

ing and telecommunications are greatly aided by the video display function of the DVI. A more professional presentation is possible when the Model 100 is operated in the 80 character screen mode. At some point in time, the serious TRS-80 Model 100 owner must consider the addition of this valuable peripheral to his or her system.

CHAPTER 8 Investigating the BCR Connection

THE WORLD OF BAR CODE

By now, nearly every citizen of the western world is familiar with bar code, those ubiquitous little stripes that appear on our magazines and cereal boxes. Bar code is a technique which converts letters and numbers into digitized bars which are readable by computers. Though devices exist that allow computers to read a conventional printed page, they are both complex and expensive. The numerals appearing at the bottom of your bank checks is one example of OCR (optical character recognition) that is practiced in the business world today. Bar code reading is more reliable and uses instruments that are far less costly to accomplish the same purpose. All that is required is to first translate the data to be printed into a coded series of thin and thick stripes. These patterns are then printed and can be scanned by a simple device (called a wand) attached to a computer. The wand interprets these stripes as electronic pulses which it sends to the computer. The software program in the computer then converts the pulses back into the letters and numbers that made up the original data. Depending upon the intended application, the data is then further processed to yield inventory information, names and addresses, etc.

Many different forms of bar code patterns have been developed, each serving a special function for one industry or another. One example is the UPC (Universal Product Code -



Figure 8.1 Universal product code (UPC) examples

see Figure 8-1) that is a numeric-only retail code used for identification on most commercial products. Code 3 of 9 is another form of bar code that is used to express uppercase alphabetical characters as well as numbers. It was originally created to expedite inventory handling for the U.S. military. Yet another popular bar code format is the Plessey Code which is limited to numeric characters only for commercial inventory systems. All of these codes make use of a combination of wide and narrow stripes and spaces. The Plessey Code, as an example, is a binary code in which each character is designated by a group of 4 bars and 4 spaces. Only the arrangement of wide versus narrow differentiates one character from another.

The Model 100 Bar Code Port

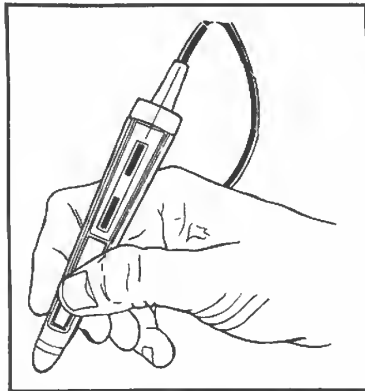


Figure 8.2 A typical hand-held bar code reader

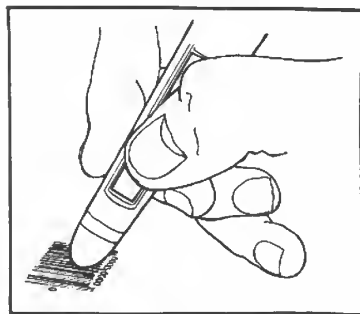


Figure 8.3 Scanning the bar code

Radio Shack incorporated a bar code reading capability into the TRS-80 Model 100 and thus added one more valuable feature to this powerful portable computer. A 9 pin connector is located on the left hand edge of the Model 100 that accepts the wand manufactured by them. Under \$100, this accessory is identified as part number 26-1183. It is packaged with a comprehensive *Owner's Manual* and a cassette containing necessary operating software. The programs contained on the cassette consist of machine language routines that decode any of the three popular formats mentioned previously. In addition, some simple BASIC programs that permit you to experiment with bar code reading are included. The wand utilizes a simple LED (light emitting diode) circuit that sends pulses to the Model 100 corresponding to the black stripes and white spaces it has scanned. No power is required for the wand as it derives what little energy it needs from the Model 100. It is compact, light-weight, and as simple to use as a pencil (see Figure 8-2). Scanning of bar codes is accomplished by whisking the wand reader quickly and smoothly over the face of the printed code as depicted in Figure 8-3.

Applications for Bar Code

Many uses exist for small business and personal application bar code reading, a few of which are itemized here:

1. Inventory Control

You have undoubtedly witnessed the latest in electronic wizardry at your local supermarket check-out stand. A form of bar code reader (usually laser equipped) is built into the pass-through counter. The checker deftly passes each can or package of food over the unit and a rewarding "beep" indicates a successful "read" of the printed code that each food product now includes on its label. In fact, the food industry years ago, in a rare display of self-imposed standardization, passed mandatory rulings that require a UPC code to appear on all products. The odd-looking lines and spaces are interpreted by the store's computers to indicate a unique food item of a particular size. A computer-maintained list of all items is referenced for the latest price and the cash register responds to this information. Simultaneously, a perpetual inventory of food stock is updated and daily reports and purchase orders are issued. The TRS-80 Model 100 permits small businesses to accomplish the same kind of control over their inventory by the same methods. A warehouse can be conveniently "scanned" and material counts can be made. The movement of goods in and out of stock can be monitored and timely reports created. Bar Code reading makes this a reality, even on so small and inexpensive a scale as this.

2. "Pantry" control

Just as the supermarkets keep track of their stock, so can the housewife employing only the Model 100 and a bar code reader. With the proper program running in the machine, it is possible to read each food item that comes into the home and those that are used for meal preparation. A computer-generated shopping list is the result of this tracking action. While a bit more trouble than scribbling a grocery list on the kitchen bulletin board, the accuracy and completeness of the Model 100 method may justify the added motions. Food budget analysis, eating habits, calorie counting and other family food statistics are a serendipitous fall-out of this effort.

3. Computer program transfer

Perhaps the most useful application for bar code readers that are compatible with the TRS-80 Model 100 is for the transfer of BASIC programs into the machine from off the printed page. This capability is very significantly demonstrated by the pioneer work accomplished by PCM, the *Portable Computing Magazine*. Starting with their April, 1984 issue, they have been publishing useful utility program listings in Code 3 of 9 format. Rather than having to "key in" a lengthy program or purchase a cassette, it is now possible to read a program into the machine directly from the pages of their monthly publication. This technique saves considerable time, cost and frustration. Through the kind permission of Courtney Noe, the Managing Editor of PCM and with the assistance of his capable Technical Editor, Danny Humphress, we are able to include in this book detailed information and examples.

Scanning PCM'S Pages

Lonnie Falk, the Editor and Publisher of PCM-The Portable Computing Magazine, stated in his April, 1984 issue, "We're absolutely delighted to be the first magazine in history to produce a truly workable program for reading bar codes into your computer." Mr. Falk goes on to say, "Of greater significance, however, is the fact that we plan to print several programs in bar code every month from now on. What that means is that you will - with the help of a \$100 bar code reader available from Radio Shack and other sources - not have to type in programs, but simply load them in by skimming your bar code wand over the codes in PCM!" He has kept his word thus far, having printed a number of useful, non-trivial programs in code each month since then. His staff, under the direction of Courtney Noe, also developed the necessary software that turns the TRS-80 Model 100 into a bar code reading machine. That program has been modified and corrected by them in succeeding issues and is reprinted here with their permission.

```
10 MAXFILES=2
20 CLEAR 800,61788
30 RUNM"B30F9"
```

```

100 CLS
110 PRINT STRING$(40,"-");
120 PRINT "      PCM Bar Code Program Decoder"
130 PRINT STRING$(40,"-")
140 OPEN "WAND:" FOR INPUT AS 1
150 PRINT@212,"Scan First Line"
160 INPUT#1,S$:GOSUB 1000
170 IF LEFT$(D$,3)<>"001"THEN ER%=1:GOSUB 3000:GOTO 160
180 FS$=MID$(D$,4,6)
190 OPEN FS$ FOR OUTPUT AS 2
195 PRINT@212,STRING$(15,32);
200 PRINT@132,"Reading: "+FS$
210 LC%=1:PL$="":D$="001"+RIGHT$(D$,LEN(D$)-9):GOTO 2070
1000 / *** DECODE STRING ***
1010 D$=""
1020 FOR I=1 TO LEN(S$)
1030     SS$=MID$(S$,I,1)
1040     IF SS$<>"$"THEN 1100
1050     SS$=MID$(S$,I+1,1)
1060     SS$=CHR$(ASC(SS$)+32)
1070     I=I+1
1080     GOTO 1200
1100     IF SS$<>"%"THEN 1200
1110     SS$=MID$(S$,I+1,2)
1120     SS$=CHR$(VAL(SS$))
1130     I=I+2
1200     D$=D$+SS$
1220 NEXT I
1230 RETURN
2000 / *** READ BAR CODE ***
2010 PL$=""
2020 INPUT#1,S$:GOSUB 1000
2030 LX=VAL(LEFT$(D$,3))
2040 IF LX-LC%>1 THEN ER%=2:GOSUB 3000:GOTO 2020

```

(continued)


```
2050 IF LX-LC%<1 THEN ER%=3:GOSUB 3000:GOTO 2020
2060 LC%=LX
2070 PRINT@280,STRING$(39,32);
2080 PRINT@212,"Scan line ";LC%+1;
2090 FOR I=4 TO LEN(D$)
2100   C$=MID$(D$,I,1)
2110   IF C$=CHR$(13) AND RIGHT$(PL$,5)="DONE" THEN 2160
2120   IF C$=CHR$(13) THEN PRINT#2,PL$:PL$="":GOTO 2140
2130   PL$=PL$+C$
2140 NEXT I
2150 GOTO 2020
2160 CLS:CLOSE:CALL 61807:MENU
3000 / *** ERROR CODES ***
3010 SOUND 5000,10:SOUND 8000,10:SOUND 5000,10
3020 IF ER%=1 THEN ER$="You must scan line 1 first!"
3030 IF ER%=2 THEN ER$="You've SKIPPED a line!"
3040 IF ER%=3 THEN ER$="You've ALREADY SCANNED this line!"
3050 PRINT@280,STRING$(39,32);
3060 PRINT@280+(20-.5*LEN(ER$)),ER$;
3070 RETURN
```

Having obtained a Radio Shack Bar Code Reader (part number 26-1183), the necessary steps to achieve reliable bar code reading of the programs available in PCM magazine are as follows:

1. Enter BASIC and type:
CLEAR 110,61788 <enter>
2. Place the cassette supplied by Radio Shack with the bar code reader in your cassette recorder. Rewind it, if necessary, and press the PLAY button.
3. Type: CLOADM "B3OF9" <enter>
4. After the tape has been read in, type:
SAVEM "B3OF9",61788,62611,61824 <enter>

5. Manually type in the program listed above and save it on your Model 100 as BAREAD.BA. Be sure to make at least two backup copies on cassette.
6. At this point, there should be two new files listed on the Main Menu of your Model 100, BAREAD.BA and B3OF9.CO.
7. From the Main Menu, run the BAREAD.BA program and follow the instructions given on the display. The program keeps track of the lines you have scanned and notifies you if you forgot to scan the first line, if you skipped over a line, or if you inadvertently scanned the same line twice.

When the last line of the printed program in the magazine has been scanned, the program you just read is automatically saved for you and will appear as a new entry on the Main Menu. At this point it can be treated as any other BASIC program. It can be saved on cassette, listed or RUN whenever you wish. In each month's issue of PCM, a list of "Tips for Successful Bar Code Reading" are reprinted. These instructions are very clearly stated and, if followed, will virtually guarantee a successful read of the bar code printed programs. Here, for your edification, are those instructions as they appear in the pages of PCM:

1. Use your arm to move the wand – not your wrist.
2. Use an even, smooth speed.
3. Keep a constant angle to the code (slightly less than 90 degrees).
4. Use a straightedge such as a plastic ruler or an index card to guide your wand evenly across the code. A metal edge could damage your wand.
5. If you experience problems scanning a line, move your straight edge slightly up or down and try reading a different part of the code – there may be flaws in the printing on the spot you're trying to read.

6. Use a back-and-forth motion when a line does not read in on the first try.
7. Make sure that the tip of your bar code reader is free of dust.
8. Keep the LED on your bar code wand clean.
9. Use a piece of non-reflective plastic, such as the one provided with your bar code wand, to protect the code from scratches.

Figure 8-4 is a listing of a short, simple example of bar code taken from the pages of the May, 1984 issue of PCM. The program, its instructions, and its bar code representation are included here through the courtesy of PCM and is intended as a visualization of a bar code.

Summary

This chapter has been dedicated to the technique of bar code reading. This novel capability of the TRS-80 Model 100 opens the door to a number of useful applications for both the home and small business. For the personal computerist, the programs offered in PCM magazine in bar code provide a painless method for entering software into the Model 100. It can be assumed that as the concept of bar code reading gains in popularity, that other publications will also offer many useful programs and data files in this fashion. In any event, the Model 100 owner is well advised to obtain and experiment with this unique and fascinating accessory.

WAKE UP!

You use your Model 100 during the day; now let it work for you overnight. This quickie program will turn your computer into an alarm clock. You can use it when you don't want to entrust such an important thing to a hotel wake-up call or to remind yourself of an important meeting.

Set the alarm time by entering it in "HH:MM:SS" format when the program asks. When the moment is at hand, you will be notified with a continuous "beep" from your computer. The beeping will continue until you press BREAK to stop the program. One more thing, it's highly recommended that you use your AC adapter for this program. Most batteries would not make it through the night.

The listing:

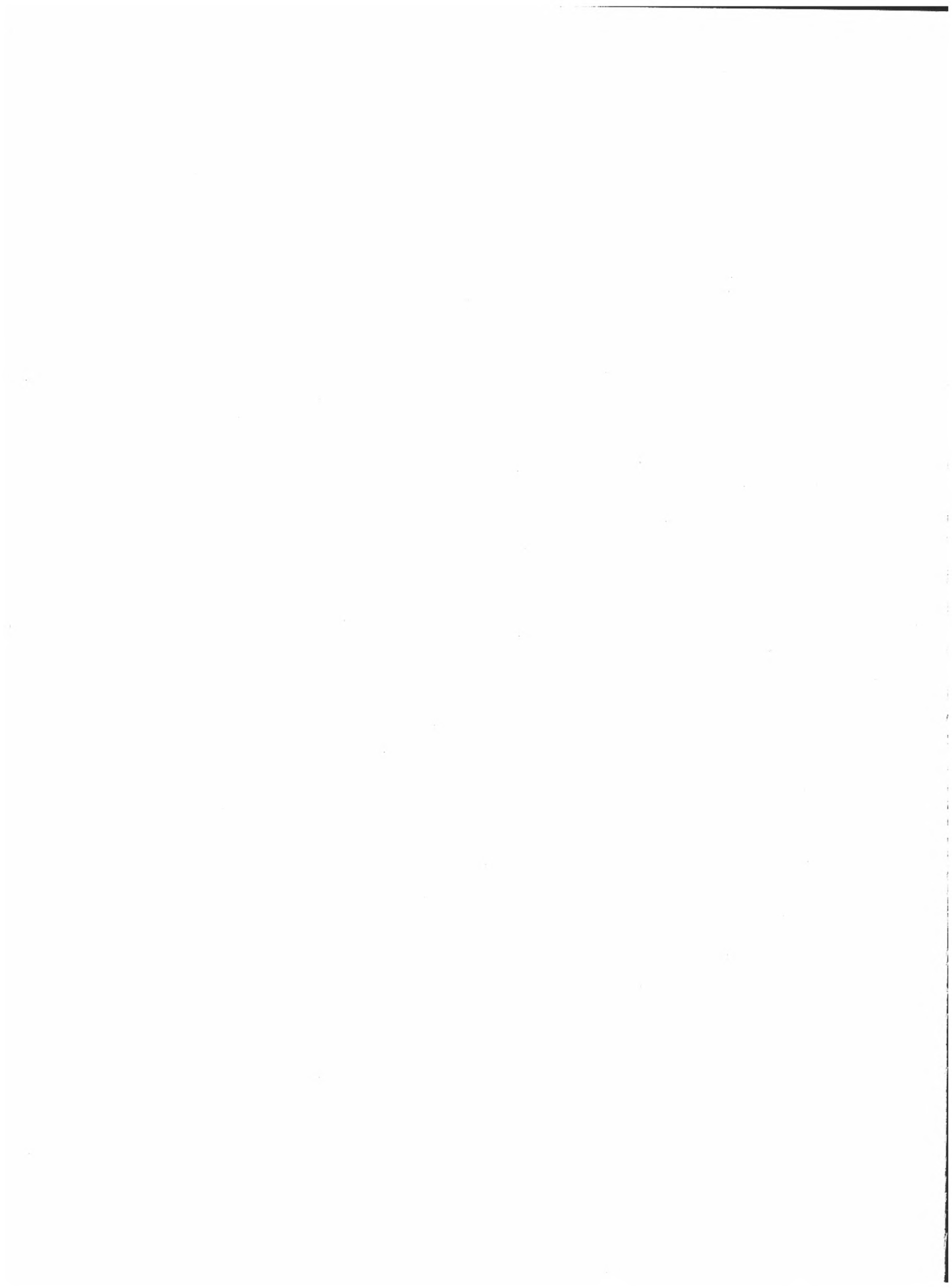
```

5  CLS:GOSUB 60
10 PRINT"Enter Time To Wake-up:";
20 INPUT A$:IF A$="" THEN RUN
30 IF TIME$<>A$ THEN GOSUB 60:GOTO 30
40 BEEP:FOR I=1 TO 10:NEXT I:GOTO 40
60 PRINT @0,"Time is now: "TIME$:RETURN

```



Figure 8.4 A sample bar code program



PART II The Applications



CHAPTER 9 Looking at the Programming Languages

BASIC - THE RESIDENT PROGRAMMING LANGUAGE

The TRS-80 Model 100 differs radically from other computers both in size and performance. It, and a few companion battery-operated machines, represents the product of many technologies combined into one state-of-the-art device. The latest advances in liquid-crystal manufacturing processes have given rise to the large display screen which this computer features. The art of creating LSI (Large Scale Integration) circuits permits an enormous amount of computing power to be packed into a small unit. All of these technologies, plus others, have been brought together to produce this wonder of portable computing capability.

One important thing, however, that the Model 100 has in common with all other computers, is the need to be programmed. All computers share this characteristic; that they cannot perform even the simplest task without direction from you, the user. Just as an automobile cannot start itself and run down to the drugstore on its own, neither can any computer turn itself on and perform any task without human intervention. The "running" of a computer is accomplished by giving it step-by-step instructions in the form of a program. The term "software" refers to these programs. The machine itself is identified as "hardware".

There are three methods for programming most computers. The first technique is referred to as *machine language programming* and consists of entering information into the machine in the most fundamental form possible. At the heart of every computer is a CPU (Central Processing Unit). This device in the Model 100 takes the form of a single integrated circuit chip, the 80C85. It can recognize a few hundred different instructions which it must receive, one by one, from its memory. An example of one such instruction is the one that tells the CPU to move a number from a designated memory location to a register so that a subsequent operation can take place. Machine language programming can be accomplished on the TRS-80 Model 100 but it is extremely tedious and is certainly not recommended for programs of any significant complexity (Figure 9-1).

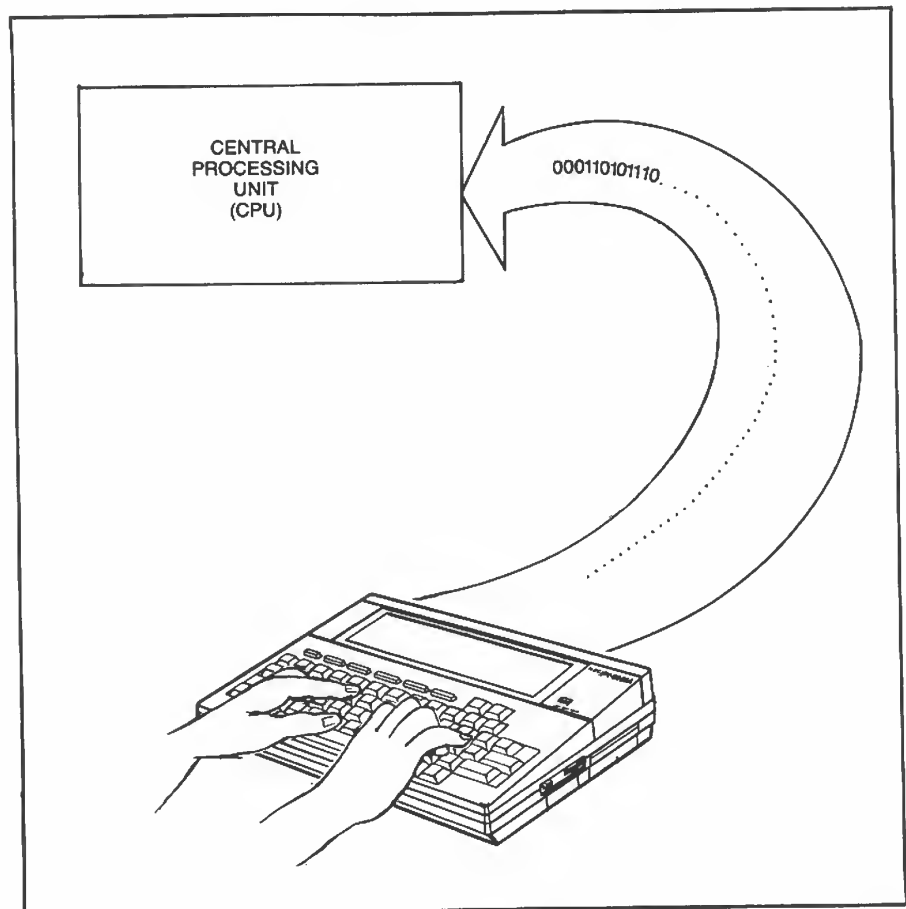


Figure 9.1 Machine language programming

Another method of programming is referred to as *assembly language programming*. The task of creating a useful set of instructions for the computer is eased by making use of an *assembler* program. The assembler acts as a translator of certain mnemonic (symbolic) codes entered by the programmer (Figure 9-2). Internally, the codes are converted into the same step-by-step instructions that the computer recognizes as machine language. This technique provides a short-hand approach to machine language programming and results in faster, more accurate man-machine communication.

The third method of programming moves beyond this plateau of effort and makes use of a *high-level language* as the intermediary between the programmer and the computer. FORTRAN, COBOL and BASIC are three of the more popular high-level programming languages in use today. They permit

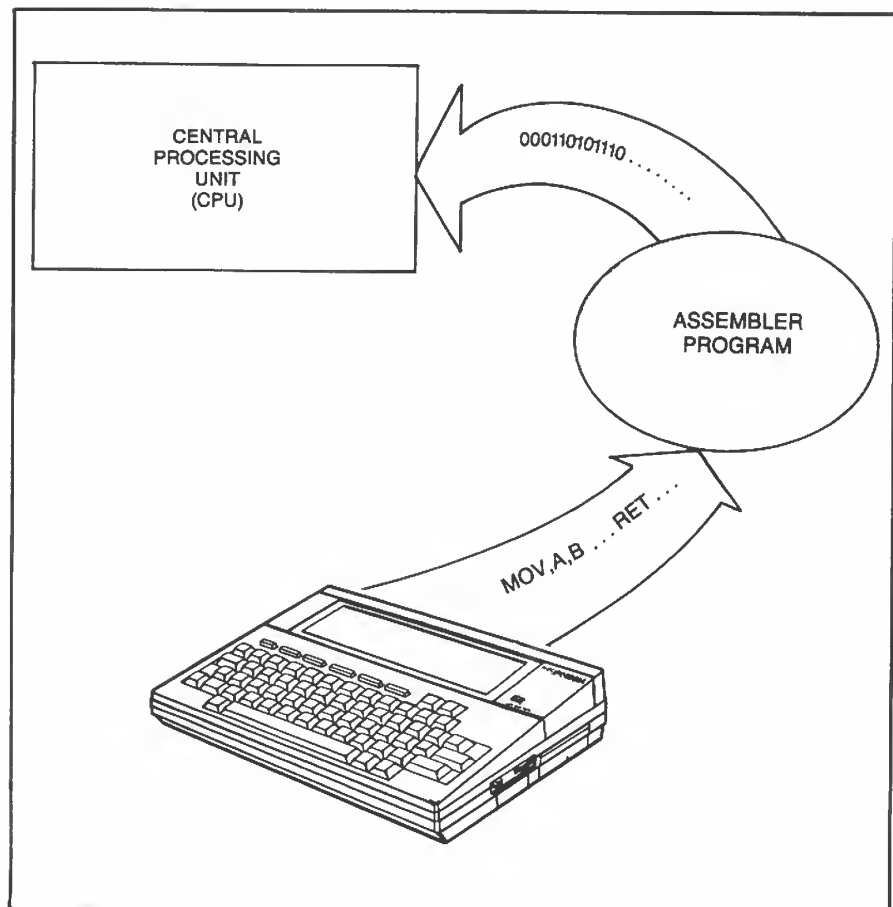


Figure 9.2 Assembly language programming

the programmer to write instructions in a crisp, intelligible manner. They are then translated into the fundamental code that the computer understands (Figure 9-3).

While producing the same results for the computer, these three levels of programming become progressively easier for the human. Dozens of separate instructions are necessary to calculate the square root of a number using machine language programming techniques, but an assembler may reduce the count to perhaps four or five. Typically, any high-level language handles that procedure with a single statement.

There is a penalty paid for the use of a high-level programming language. The language itself must reside in the computer, and it occupies valuable memory space. In addition, the program created by use of the high-level language may be larger than its machine language counterpart. Lastly,

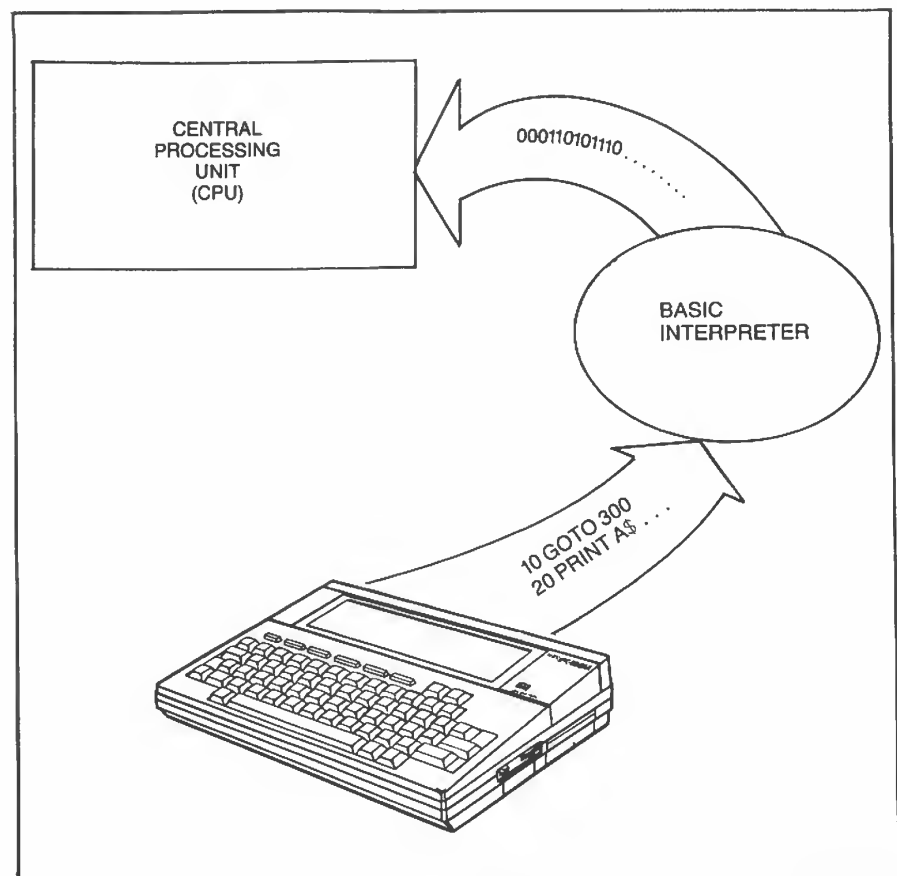


Figure 9.3 High-level language programming

the program, more than likely, will execute much more slowly than it would had it been written by either of the other methods. With these considerations in mind, let us explore further the realm of BASIC, the resident high-level programming language of the TRS-80 Model 100.

What is BASIC?

BASIC is an acronym for *Beginner's All-purpose Symbolic Instruction Code*. It was created in the mid 1960's on the Dartmouth University campus as a simplified programming language. Students were having difficulty in their encounters with FORTRAN; thus BASIC was developed as a more friendly vehicle for the instruction of computer programming. In the years since, BASIC has become the most frequently used programming language, and owes much of its popularity to the proliferation of micro-computers. It is relatively simple to learn and, at the same time, powerful enough to handle complex tasks.

Since 1976, the Microsoft Corporation has been the leader in the field of creating versions of BASIC for each of the emerging micro-computers. It is no surprise that Radio Shack would seek their help in developing a special version for their computer. It is identified as Model 100 BASIC and is similar in many respects to the BASIC in a host of other machines. It is very thoroughly referenced in the *Users Manual* supplied with the Model 100. This chapter is not intended to serve as a primer for BASIC programming, but rather, to draw your attention to those elements of Model 100 BASIC that are unique to this machine. In this manner, it is hoped that the reader who has previous knowledge of BASIC programming may quickly identify the few dialectal differences that exist in this machine.

Functions, Commands and Statements

The language of BASIC consists of a library of words which serve either as *functions*, *commands* or *statements*. A function is used to express a mathematical concept and to carry

out a calculation. Addition, subtraction, division and multiplication are all functions and are represented in BASIC by the symbols `+`, `-`, `/` and `*` respectively. More complex functions can also be found in the language, such as `SQR` for square root and `INT` for integer. The list of mathematical functions available in Model 100 BASIC is considerable and permits even the most complicated formulae to be employed. In addition, the functions that provide for "string" or word manipulation are imbedded in this version of BASIC. Not only are `LEFT$`, `RIGHT$` and `MID$` available, but also the very useful `INKEY$` and `INPUT$`.

A command is a keyword that inaugurates a specific action. In Model 100 BASIC, as in most versions of Microsoft BASIC, the commands such as `RUN`, `LIST`, `PRINT` and `SAVE` are used. These are employable in both the direct (from the keyboard) and indirect (within a program) modes. Because of the TRS-80 Model 100's reliance on an external cassette recorder for storage, a group of commands specific to that purpose are included. These will be discussed and illustrated later in this chapter along with other unique keywords.

Statements are words, or combinations of words, in BASIC that create an action or identity within the program. `LET X=10` is an example, as is the similarly familiar `FOR/NEXT` loop. A rich variety of statements are present in Model 100 BASIC, a number of which were especially created for the Radio Shack machine.

BASIC programming consists of making use of the proper combination of functions, commands and statements. The greater the lexicon of keywords available to the programmer, the more sophisticated the program that can be created. The TRS-80 Model 100 utilizes a powerful and unabridged version of BASIC that will allow this "David" of a computer to execute "Goliath" programs.

Unique Keywords

Model 100 BASIC offers more than 100 keywords in its library. Appendix C contains a complete list of these words and their proper format. The majority of these phrases are directly interchangeable with the same keywords to be found in all other BASIC's implemented on hundreds of other kinds of

computers manufactured today. Special hardware requirements of the Model 100 dictated that some unique words be created that would allow the programmer to adapt his or her task to this machine. Most of these new keywords address themselves to input/output action and permit the display, printer and cassette to be utilized properly from within a running BASIC program. What follows is an alphabetical summary and description of these unique keywords.

Beep

BEEP is a command that generates a sound one-eighth second long from the Model 100's internal speaker. The word is used by itself with no additional parameters. You, as a programmer, might wish to employ it to alert a user to an incorrect keyboard entry. An example of what it sounds like and how it can be invoked is exemplified in the following short routine.

```
100 INPUT "How much is 9 times 8";X
110 IF X<>72 THEN BEEP:GOTO 100
120 PRINT "THAT'S CORRECT!"
```

If this program is entered and RUN it will BEEP and repeat the question until the right answer is given.

Call

A very unique command imbedded in Model 100 BASIC is the CALL command. It enables the programmer to execute a machine language routine that had been previously loaded into a protected memory area (see CLOADM). It also permits the user to invoke dozens of sub-routines that are permanently programmed into the machine's ROM. One example is the routine: CALL 23164,0,23366:CALL 27795 which can be used to reset the function key list at the end of a program, in which the keys had been redefined. Other useful and available CALLs are:

CALL 21117 - Invoke TELCOM

CALL 27721 - Invoke BASIC

CALL 24046 - Invoke TEXT

CALL 23400 - Invoke ADDRSS

CALL 23407 - Invoke SCHDL

CALL 32454 - Return to normal operating system from Disk BASIC

This library of useful utilities can be drawn from, as needed, to enhance and frequently speed-up the performance of a BASIC application program.

CSAVE/CLOAD/CLOAD?

These three commands are reserved for the saving, loading, and verifying of BASIC programs. As you create a program under BASIC on the Model 100, your entries are being stored in the machine's available RAM (Random Access Memory). If the program is of any value, you will want to preserve it on tape. CSAVE is the command that enables that action. CLOAD brings your program back into memory from tape, and CLOAD? simply verifies that a correct recording has been made.

CSAVEM/CLOADM

These two commands are similar to the CSAVE and CLOAD commands defined above, but are reserved exclusively for the cassette recording and playback of machine language programs rather than BASIC programs. The addition of the letter M to each of these commands makes this distinction. There is no counterpart to the CLOAD? command.

Clear

The CLEAR statement in Model 100 BASIC is essentially the same as you would find in all other versions of BASIC. By itself, it clears the values of all numeric and string variables. If followed by a number, that number becomes the amount of string space set aside for storage. An optional numeric expression following that sets the top of memory leaving a protected area for machine language routines. See appendix C for the correct statement format.

COM On/Off/Stop

The COM command is used in BASIC programs that call for the input of information through the RS-232C port during

their execution. COM ON tells BASIC that such input will follow, and it allows the program to be interrupted should a transmission be received. COM OFF negates that condition. ON COM GOSUB will divert the BASIC program to a designated subroutine upon receipt of a transmission. COM STOP inhibits that action but leaves it pending until the next COM ON statement is encountered. These commands, combined with OPEN "COM:", are useful for the creation of communication programs in BASIC. Conceivably, one could author a program that lets the TRS-80 Model 100 dial up another computer, wait for its response and then transmit and receive data from it. While most of those functions are available in the resident TELCOM program (see chapter 11), they are applicable only to the modem channel and not to the RS-232C port

CSRLIN/POS

These two functions allow the programmer to identify the position of the cursor at any given moment. CSRLIN returns the current vertical position of the cursor and POS returns the horizontal. The top line of the screen is labeled as "0" and the bottom, "7". Similarly, the left-hand edge of the screen is noted as column "0" and the right-hand side is "39" (Figure 9-4). The lower right-hand corner of the display corresponds to CSRLIN 7 and POS 39.

Entering the one-line program, CLS:PRINT:PRINT CSRLIN,POS(0) <enter>, will yield the numbers 1 and 14, indicating that that is where the cursor was at the time the program was invoked. POS requires the dummy expression, "(0)" but CSRLIN performs correctly with no additional parameters.

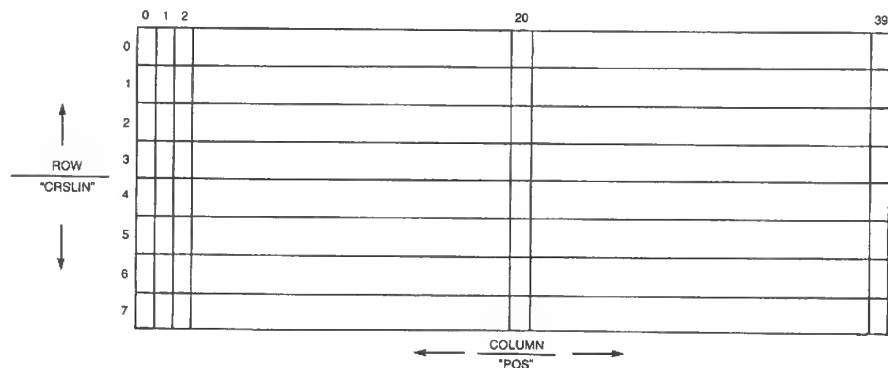


Figure 9.4 Screen layout

Date\$/Day\$/Time\$

These three functions provide the means for both entering and retrieving the current date, day of the week and time. As we demonstrated in chapter 1, it is always possible to enter a new value for either function. `TIME$ = "hh:mm:ss"` is the proper format for inputting a new time while `DATE$ = "mm/dd/yy"` is correct for date entry. `DAY$ = "xxx"` (the first three letters of the day of the week) sets the proper day into memory. The statement, `PRINT DATE$`, `PRINT DAY$` or `PRINT TIME$` will retrieve those current values from the Model 100 and place them on the display. Benchmark timing between two events is thus made possible from within a program that is being executed.

Files

Invoking this command from within a BASIC program shows the user the current directory of files. This can be useful in applications where the operator must make a selection from various files stored in the machine.

HIMEM

This reserved function returns the top address of memory available to BASIC. The `CLEAR` command can set the value if a protected area is required.

IPL

It is possible to command the TRS-80 Model 100 to jump immediately to a pre-determined program whenever the power switch is turned on. Three steps are required to accomplish this; the command `IPL "filename.BA" <enter>` must be typed in, the program in question must be "Loaded" into BASIC and the computer must be turned off when still in BASIC. The next time the machine is turned on, instead of displaying the Main Menu, the Model 100 will move directly to the program you stipulated and execute it.

An example of IPL's usefulness is demonstrated in the following program contributed by Larry Wake of Radio Shack. It provides password protection and makes your Model 100 secure against intruders. Whenever your machine is turned on, the unit bypasses the Main Menu (because of the IPL function) and displays a row of asterisks, beeps, and waits for a key combination entry from the user. If the entry is correct, then normal operation begins. Otherwise, the Model

100 shuts itself off and when re-started it will pose the same password request again.

```

5   POKE 63056,128 REM DISABLE BREAK KEY
10  ON ERROR GOTO 100
15  CLS:BEEP:PRINT @160," "STRING$(38,"*")
20  A$=INKEY$:IF A$="" THEN 20
30  IF A$<> CHR$(nnn) THEN POWER OFF, RESUME:GOTO 15
40  POKE 63056,0:MENU REM ENABLE BREAK KEY
100 RESUME 10

```

In place of the letters nnn in line 30 above, substitute the value that can be found in appendix I. For example, if you wish the password combination to be CODE/J then the proper value for nnn is 219. This can only be entered by pressing the CODE key, the Shift key and the letter j simultaneously, an admittedly unique combination. If you forget your own password it may be necessary to RESET the Model 100 and thereby lose any files you had present.

It is also possible to use the IPL feature to enter TELCOM, ADDRSS or SCHEDL directly by initiating the IPL TELCOM (or other) statement. IPL (Initial Program Load) can be "cleared out" by typing: IPL "" <enter> .

Key

Any of the 8 programmable function keys can be defined by use of the KEY function. Re-assignment is simple and can be invoked from either the keyboard or from within a program. This function provides a convenient method for producing a control statement of up to 15 characters in length with a single keystroke. An example of the correct format for this command is:

```
KEY 7,"CLS:BEEP:MENU"+CHR$(13)<enter>.
```

Pressing F7 will then automatically clear the screen, issue a beep and return you to the Main Menu. The CHR\$(13) statement at the end of the line represents pressing the <enter> key after the command MENU.

Key On/Off/Stop

These statements either enable or disable the function key interrupt. ON enables the operation so that pressing any defined F key causes a program branch, as directed by an ON KEY GOSUB routine. OFF disables that capability while STOP only temporarily inhibits the function until the next KEY ON is issued, and then causes BASIC to branch as directed. In combination with the KEY command, it is possible, therefore, to re-define the functions of each of the eight F keys, and then, depending on a choice made by the operator, branch to a special sub-routine relevant to that selection. Upon conclusion of the program, it is then possible to restore the original definitions using the CALL routine example described earlier (see CALL).

LCOPY

This command instructs the printer to copy what is on the screen. This can be useful, from within a program, when the user has indicated that a hard-copy of a display presentation is needed. The results are the same as though the PRINT key had been pressed.

Line

The TRS-80 Model 100 has a number of unique graphics capabilities. As described earlier in chapter 2, individual pixels can be lit up or extinguished by use of the PSET and PRESET commands. In addition, a host of special graphic symbols (see appendix B) can be generated and combined to form interesting displays. LINE is another powerful graphics command using a minimum of code instructions, that is capable of creating lines, boxes and other useful geometric figures. As an example of its line drawing ability, enter BASIC and type:

```
CLS:FOR X=1 TO 63:LINE(19,63-X)-(239,63),X;NEXT <enter>
```

This one-line instruction first clears the screen, then draws a line across the bottom of the display, tilts upward one pixel increment and erases all in its path. It proceeds in this sweeping motion alternately writing and erasing until it reaches the top of the screen. The odd pattern generated in this fashion results from the "staircase" resolution related to the size of the

individual pixels. LINE uses the same co-ordinates as does PSET and PRESET. In the statement above, "19,63 - X" tells BASIC to start drawing the line from the 19th horizontal and the 63rd (minus the value of X) vertical pixel point. The line ends at the 239th horizontal and 63rd vertical point (roughly, the bottom of the display). The trailing X alternately becomes an odd or even number. Odd numbers instruct BASIC to "write" a line and an even value for X causes BASIC to "erase" the line.

LINE can just as easily create boxes and, under your instructions, fill them or empty them. A demonstration can be witnessed by typing:

```
CLS:FOR X=25 TO 65 STEP 5:LINE(X,X/4)-(232-X,85-X),X,BF:NEXT
```

This instruction clears the screen and then draws a "black" box as a result of the BF (Box Fill) parameter and the value of X being an odd number. In the next step of the loop, the dimensions shrink and with the value of X even, a "white" box is superimposed on the first. This pattern is repeated seven more times in diminishing scale.

Although these examples are trivial, LINE can just as easily create bar charts and histograms to graphically portray sales projections and other useful data in a pictorial manner.

MAXFILES

As many as 15 files can be OPENed simultaneously during the operation of a BASIC program. It is necessary to inform BASIC, however, what that number will be so that BASIC can reserve a buffer in memory for each of them. This command establishes the MAXimum number of files that the programmer envisions for that application. In the absence of a specific redesignation, the number of permissible open files is set to one.

MDM On/Off/Stop

These statements (in a manner similar to KEY ON/OFF/STOP) either enable or disable the ON MDM GOSUB interrupt. ON enables the operation so that if a character is received via the modem, BASIC branches to the subroutine identified in your ON MDM GOSUB command. OFF disables that capability, while STOP temporarily inhibits the function until the next

MDM ON command is issued, which then causes BASIC to branch as directed.

MENU

When the MENU command is entered from the keyboard or when it is encountered within a program, BASIC is exited and the user is returned to the Main Menu. This is commonly employed at the termination of an application program.

Motor On/Off

This command controls the ON/OFF function of the cassette recorder motor. Typical usage would include those application programs that provide for data storage on tape during their execution.

NOTE: If you have interrupted a cassette SAVE by pressing the BREAK (Shift/Pause) key, the cassette motor may, under some circumstances, continue to run. It is important that you enter the MOTOR OFF command to reset the Model 100's cassette relay and spare the batteries from excessive drain.

Power

This useful command sets the time delay for unattended "shut-down" of the Model 100. Normally, the computer will turn itself off if no key is pressed within 10 minutes. This period is alterable, or it can be completely negated by invoking the POWER command properly. POWER CONT implies continuous power, while POWER 400 extends the delay to 40 minutes. POWER OFF causes an immediate shut-down of the Model 100. Start-up is then only possible by flicking the ON/OFF switch.

PRINT @

PRINT @ is the complement to the combination of CSRLIN/POS. Whereas they yield the current location of the cursor, a PRINT @ command places the cursor at the defined spot on the display. Entering PRINT @ 180, CHR\$(158) <enter> for example, moves the cursor to the middle of the screen and displays a heart-shaped symbol. Figure 9-5 illustrates the display cell numbering (from 0 to 319) that identifies the locations for this command. Proper use of this feature adds a professional appearance to any application program.

[illegible]

Figure 9.5 Print @ display locations

PSET/PRESET

This pair of complementary statements direct any spot (pixel) on the display to be turned ON or OFF. PSET (PixelSET) activates a location and PRESET (PixelRESET) resets it. Typing in:

```
CLS:FOR Z=1 TO 4:FOR X=20 TO 220:PSET(X,30):NEXT:  
FOR X=220 TO 20 STEP-1:PRESET(X,30):NEXT:NEXT <enter>
```

demonstrates this “dot/on-dot/off” capability. Use of this graphic technique can enhance an otherwise bland program.

Screen

The SCREEN statement provides a means for canceling the function key display at the bottom line of the screen. SCREEN 0,0 blanks it out leaving the eighth line available for other use. SCREEN 0,1 reinstates it. Most professional BASIC programs for the Model 100 will begin and end with this pair of statements. Chapter 7 describes expanded use of the SCREEN statement when your computer is used with Radio Shack's Disk/Video Interface.

Sound

The SOUND command triggers a tone burst from the Model 100's internal tone generator. The device is not a conventional loud-speaker, but rather a compact, low-power, piezo-electric transducer. The term SOUND is followed by two parameters. The first value designates the tone and ranges, from a low note of 0 to the highest pitch obtainable at 16383. The second value sets the duration of the note through a range of 0 to 255. Each unit equals two-hundredths of a second. Thus

the command SOUND 5586,50 will produce a one second tone of middle A on the musical scale. Figure 9-6 provides a reference table of the musical scale codes. Just as PSET and PRESET can enhance a program with their graphic cavorting, so too can SOUND be employed to add another dimension.

Time\$ On/Off/Stop

This set of statements will either enable or disable the ON TIME\$ GOSUB interrupt. ON enables the function so that if a designated time has been reached the BASIC program will branch to a sub-routine. OFF disables this capability while STOP temporarily inhibits the function until the next TIME\$ ON command is issued. The designated branch would follow immediately. TIME\$ ON coupled with the ON TIME\$ GOSUB command adds a powerful "alarm clock" capability to the TRS-80 Model 100. Appointment calender programs and other scheduling functions can be implemented if proper use is made of these BASIC statements.

MUSICAL SCALE TABLE							
OCTAVE							
	1	2	3	4	5	6	
C O D E	C	-	9394	4697	2348	1171	587
	C #	-	8866	4433	2216	1103	554
	D	-	8368	4184	2092	1045	523
	D #	15800	7900	3950	1975	987	493
	E	14912	7456	3728	1864	932	466
	F	14064	7032	3516	1758	879	439
	F #	13284	6642	3321	1660	830	415
	G	12538	6269	3134	1567	783	-
	G #	11836	5918	2954	1479	733	-
	A	11172	5586	2793	1396	693	-
	A #	10544	5272	2636	1316	653	-
	B	9952	4968	2486	1244	622	-

Figure 9.6 The SOUND commands' musical scale range

Summary

This chapter provided an overview of the Microsoft BASIC language which is resident within the Radio Shack TRS-80 Model 100. All the machine instructions for BASIC are contained within the 32K ROM (Read Only Memory) device located behind the pry-off lid on the bottom of the unit. The provision for an additional 32K ROM chip may offer future enhancements to BASIC, such as color and novel peripheral operation. Even without such embellishments, however, Model 100 BASIC provides the programmer with a sophisticated, high-level language which has extensive application capabilities.

CHAPTER 10 Composing Your Thoughts

TEXT - THE WORD PROCESSOR

Perhaps the most popular usage for micro-computers today is word processing. Word processing is defined as the "computerized creation and editing of text." Whether it is a student's notes, a multi-paged piece of correspondence or an entire manuscript, computers have proven their value as text preparation devices. The ability to view and correct a document before printing it is but one of the benefits of word processing. The facility to re-arrange sentences, paragraphs or whole blocks of text in an instant is another typical feature of most word-processing programs. Some of the more powerful versions on the market offer both grammar and spelling checking as well as automatic hyphenation. The capability to globally "search and replace" a word or phrase automatically is yet another example of the remarkable power that many of these programs offer.

The list of features and benefits of word processing is long and valuable. Law firms, years ago, discovered the cost savings that can be achieved by preparing briefs and contracts on the computer. The reduction in re-typing time alone frequently repaid the cost of the equipment in short order. Most modern newspapers have become dependent on computers to process the mountain of text that is created daily. No other technique available today compares to the efficiency offered by these machines.

With the advent of the microcomputer and, perhaps more importantly, the battery-operated versions such as the

TRS-80 Model 100, word processing will soon have many more devotees. Students, business-persons, salespeople and others, with no previous access to large computers, now can make use of this innovative method of electronic letter-writing. The Model 100, with its built-in TEXT program, is an excellent choice to satisfy this need. While limited in its capabilities, compared to larger computers, it offers most of the valuable features needed to efficiently create and modify documents.

Working with Text

The TEXT Mode

The Main Menu always displays the five resident programs of the Model 100. The cursor (dark outline) appears over the first of these, BASIC, whenever the machine is turned on. Pressing either the space bar or the right arrow of the cursor control cluster moves the cursor over the word TEXT. Pressing the <enter> key is all that is required in order to select the TEXT mode. You are then presented with the prompt, "File to edit?". Up to six characters may be used to name a new file. The Model 100 makes no distinction between upper and lower-case letters in a filename. Every document file created in this manner in the TEXT mode has the letters .DO appended to the filename you chose. If you have named a new file, TEXT knows you are composing a fresh document and presents you next with an arrow prompt in the upper left-hand corner. You are now ready to start entering your text.

Entering Text

Entry is identical in many ways to operating a typewriter. The SHIFT keys produce upper-case letters and the CAPS key alternately switches you between upper and lowercase. The BKSP (backspace) key will correct your mistakes by backing up and erasing one character at a time. The cursor control cluster arrow keys (upper right-hand group of keys) will move you forward and backward on the line, as well as upward into previous text. These movements are non-destructive in that none of the characters in the cursor's path are erased. If text is to be added in the middle of existing words, then it is only necessary to move the cursor to that point and start typing. All

the subsequent text will shift to the right making way for the new material. Unlike a typewriter, it is not necessary to press the <enter> key at the end of each line. TEXT will "wrap around" to the next line and carry any incomplete words with it. If you hyphenate, it will leave the partial words just as you entered them. The <enter> key is used to signal the end of a paragraph and moves the cursor to the next line. The TAB key will indent your text eight spaces. If you wish to make deletions in the middle of the text, pressing either of the SHIFT keys and the DEL key simultaneously will accomplish that.

Special Functions

The CTRL (control) key and the SHIFT keys, used in combination with the arrow keys, perform special functions. These are:

CTRL and ↑ moves the cursor to the beginning of the document.

CTRL and ↓ moves the cursor to the end of the document.

CTRL and → moves the cursor to the right end of the line.

CTRL and ← moves the cursor to the left end of the line.

SHIFT and ↑ moves the cursor to top line of the screen. If it is at the top, then it will present the previous "page".

SHIFT and ↓ moves the cursor to the bottom line of the screen. If it is at the bottom, then it will present the next "page".

SHIFT and → moves the cursor one word to the right.

SHIFT and ← moves the cursor one word to the left.

The Function Keys

The eight function keys at the top of the keyboard perform special tasks when used with TEXT. Taken in order, the operations they invoke are:

F1 Find. Pressing the F1 key places you in the "search" mode. The prompt "String:" will appear which is answered by

entering any string of up to 24 characters. When the <enter> key is then pressed, the text is searched from the cursor's present location forward to the end of the document for the first occurrence of that string. If none is found, the message "No match" will appear. Unless you know approximately where the string you are seeking is located, it is best to move the cursor to the beginning of the document (CTRL and ^) and start your search from there. If a match is found, the blinking cursor will jump to the first character of the specified string. A match will be made regardless of whether upper or lowercase was specified. Repeated pressing of the F1 key and the <enter> key will move you to following occurrences of the same string. The previously designated string is retained and displayed each time you press the F1 key, but typing in a new string will cause it to be replaced.

F2 Load. The F2 key is used in order to load text previously recorded on tape (or disk) onto your current file. You might use this as a means for merging a standard set of paragraphs (lawyers call them "boiler-plate") into a contract or work proposal you are preparing. Possibly you might wish to create a new document by first loading in a previously created file and editing it to conform to your new requirements. When the F2 key is pressed, the question, "Load from:" appears. You respond by naming the document previously recorded. It is necessary, of course, to have a cassette recorder connected properly (see chapter 4) and the appropriate cassette installed and in the "play" mode. The recorder will advance the tape until the message "FOUND: filename" appears indicating that the requested file has been located. Any incoming text will be "tacked" onto the end of your current file. It can be relocated, however, by using the "Cut and Paste" feature discussed later in this chapter.

F3 Save. The F3 key, when pressed, invokes the "Save" function which enables you to record your current document on tape (or disk). The query, "Save to:" is answered by entering any filename (no more than six characters) you choose. When the recording is successfully completed, the prompt will vanish from the display. Important TEXT files should be saved in this fashion as frequently as common sense and low batteries dictate.

F7 Sel. The F7 key allows you to "select" a portion of your text to be moved into a temporary work area call the *Paste Buffer*. Its use is simple. If you have a section of your document that you wish to either erase or replicate, you *mark* the start of the section by pressing the F7 key. As you then advance the cursor to the end of the designated block, you will note that all the text in between changes into clear characters on a black background. This denotes the section to be placed in the Paste Buffer. The F7 function (Select) doesn't actually alter anything. It is used solely to bracket a portion of text to be worked on by either of the next two functions, Cut or Copy. It can be negated at any time by pressing the "BREAK" key (Shift/PAUSE). The block to be cut or copied can be as little as one letter or as large as the entire document. After locating the cursor in the text block and pressing F7, you can move forward or backward as you wish. The inverse video presentation shows you the precise text being drawn in to the Paste Buffer.

F6 Cut. After a section of the document has been highlighted by using the F7 (Select) function, you then have the option of either removing that block entirely or duplicating it elsewhere. If deletion is what you intend to do, then it is only necessary to press the F6 key after your block selection is completed. The text will vanish from the display. If you wish to *move* the text from its previous location to a different one, then you first must "Cut" it and then Paste it back in at the new spot. Remember that the "Select" function permits you to designate text that will be duplicated in the Paste Buffer. There it will remain until a new selection of text replaces it. Even after "cutting" it, therefore, it still resides in the Buffer but not on the display. The "*Paste*" function (PASTE key) will bring all the text in the buffer up to the screen, starting at the present cursor location. Since the buffer is not emptied by this process, you can replicate the text as many times as you wish at as many locations as is desired. This feature is useful for reducing text preparation time by allowing you to put an often-used phrase in the Paste Buffer and then pulling it up to your document as needed.

F5 Copy. The Copy command (F5) performs exactly the same function as the Cut command except that it doesn't

erase the designated text. After selecting the block of text with the F7 function, using the copy command duplicates it in the Paste Buffer, but it still remains in its original location. You can then introduce a copy of the text anywhere in your document by moving the cursor to the desired location and pressing the PASTE key.

LABEL. While in the TEXT mode, the last line of the display is clear of the usual function key definitions. If you wish to have them shown to you as a reminder of what each "F" key does, then press the LABEL key. Alternate pressing of this key will present the definitions or remove them. The F4 key serves no purpose in TEXT.

F8 Menu. Leaving the TEXT mode and returning to the Main Menu is accomplished by pressing the F8 key. The DO file you were working on is saved and named on the menu. Should you wish to return to it for further processing, you need not enter TEXT but can go directly to the file by selecting its name with the moving cursor block and pressing <enter>. Turning off the machine without exiting TEXT still preserves your work. It is advisable to make a cassette copy of your document as a precaution against accidents. This simple procedure takes but a few minutes and can spare you the frustration of losing valuable work. Refer to the F3 key explanation for the steps necessary to Save a DO file on tape.

Chapter 7 explains the operations of Radio Shack's Disk/Video Interface. You can save and load documents to disk rather than tape if you employ this remarkable accessory they offer. The designated filenames are preceded by either a 0 or 1 to identify on which disk drive the file resides (i.e. 0:LETTER.DO).

Printing Documents

After a document has been created using TEXT, it may be recorded on tape (or disk), transmitted to another computer or typed out onto any available printer. Making a cassette recording is accomplished from within the TEXT mode and has been described previously. An archive of your major documents on tape can provide a useful library to draw from.

As occasion dictates, it is possible to load an old document into the Model 100 and re-edit it into a new and useful letter or manuscript. It is strongly urged that you develop the habit of recording any significant text in this fashion, properly labeling it and storing it safely.

Transmitting a TEXT document to another computer will be discussed fully in the next chapter which deals with TELCOM, the resident telecommunications software. The technique of passing text from the TRS-80 Model 100 to other word-processing machines can be very useful. Portions of a larger manuscript can be conveniently created on the Model 100 most anywhere, and then merged into a master document on a computer across the room or across the continent. The portability of the Model 100 provides a means for creative writing on a plane, in a hotel room or on the patio. Memos can be written at your convenience and later transcribed electronically at the office. The combination of TEXT and TELCOM provide an extraordinarily versatile word-processing capability that is the feature strength of the TRS-80 Model 100.

The means provided for printing out a DO file is simple. Pressing the Shift/PRINT key combination will bring the question, "Width:" to the bottom line of the display. Your reply indicates how many characters across the page your printer can accommodate. Any value from 10 to 132 is acceptable. While use of this function will, indeed, provide a hard-copy of your document from your printer, the formatting capabilities are limited. For example, you may have created a two page letter and now want a copy for yourself as well as the party it is addressed to. The Shift/PRINT function has no provision for pausing between pages. If you are printing on your company letterhead, this presents a problem. Neither will Shift/PRINT permit for centering of the printing on the paper or for conveniently making additional copies. Fortunately, a number of software publishers have created various text formatting programs for the TRS-80 Model 100. They are identified and discussed in Chapter 14 along with other software available for the machine. A program written in BASIC that provides a number of missing features is included here for your use. To use it you must enter BASIC, type it in exactly as it is listed here and Save it as a BASIC file. You can give it any name you wish but PRINT.BA is most suitable.


```

1000 CLS:PRINT" ** Print program for TEXT documents **"
1010 PRINT:PRINT TAB(8)"Files available:":FILES:PRINT
1020 DEFINT X:DEFSTR A:XB=66:XC=72
1030 INPUT"File Name (select .DO file only)";AC:OPEN AC FOR
      INPUT AS 1
1040 INPUT"Page length (<enter>=66 lines)";XB:XD=XB-8
1050 INPUT"Line length (<enter>=72 chars.)";XC:X0=XC
1060 INPUT"Left margin (<enter>=0 chars.)";XG
1070 IF XG>XC-1 THEN 1060
1090 INPUT"How many copies";XH
1100 INPUT"Line spacing (1,2 or more)";XJ
1110 INPUT"Title & page numbering (Y/N)";AE
1130 IF AE="Y"OR AE="y"THEN INPUT"Page title";AF:GOTO 1150
1135 IF LEN(AF)>XC THEN PRINT"Title is too long..":GOTO 1130
1150 PRINT"Press any key when printer is ready"
1160 AG=INKEY$:IF AG=""THEN 1160
1170 IF AE<>"Y"AND AE<>"y"THEN 1200
1180 XA=XA+1:LPRINT TAB((XC-LEN(AF))/2)AF;
      TAB(XC-8)"Page"XA:LPRINT:XK=2
1190 IF XJ>1 THEN FOR X=1 TO XJ-1:LPRINT:XK=XK+1:NEXT
1200 FOR XM=1 TO X0
1210 AH=INPUT$(1,1):IF EOF(1)THEN 2000
1220 IF AH=CHR$(9)THEN AI=AI+SPACE$(8):XM=XM+7:GOTO 1250
1240 AI=AI+AH:IF AH=CHR$(10)THEN XN=XC:GOTO 1500
1250 NEXT
1260 FOR XN=XC TO 1 STEP-1
1270 IF MID$(AI,XN,1)=CHR$(32)OR MID$(AI,XN,1)=CHR$(45)THEN
      1290
1280 NEXT:XN=XC
1290 AJ=RIGHT$(AI,XC-XN):AI=LEFT$(AI,XN):GOTO 1510
1500 AI=LEFT$(AI,LEN(AI)-2):AJ=""
1510 LPRINT TAB(XG)AI:XK=XK+1
1520 IF XJ>1 THEN FOR X=1 TO XJ-1:LPRINT:XK=XK+1:NEXT
1530 AI=AJ:X0=XN
1540 IF XK>XD-1 THEN 2010 ELSE 1200

```

```

2000 LPRINT TAB(XG)AI:XK=XK+1
2010 FOR X=XK TO XB-1:LPRINT:NEXT:XK=0
2020 IF NOT EOF(1)THEN 1150
2030 XH=XH-1:IF XH<>0 THEN CLOSE:AI="":XA=0:OPEN AC FOR
      INPUT AS 1:GOTO 1150

```

When the program is RUN, it first displays all the files presently stored on your computer. This enables you to see the proper names of the various documents you have created. You are then asked to enter the name of the DO file you wish to have printed out. Be sure to match the chosen file name exactly, although the .DO appendage need not be typed. Next you are asked to enter the number of lines on the paper you are using. Eleven-inch-long paper is most common, and at six lines to the inch, it is 66 lines long. If you just press the <enter> key, the value of 66 will automatically be used by default. Other numbers can be calculated by you and used for shorter or longer paper. The next query has to do with how many characters you want on each line. If you are using 8 1/2 inch-wide paper and printing at the conventional 10 characters per inch, there is room for a maximum of 85 characters on each line. Seventy-two is a more appropriate figure and is the default value in this program. After this reply, you are asked for a number representing a left margin indent, if desired. The printing will be "tabbed" by this amount. This lets you locate the printing as desired. Pressing the <enter> key without typing in a value produces no left margin indentation. The next question, if answered with a "Y", will pause the printing so that you can change paper before going on to successive pages. The default is "N" and is used if you are printing on continuous forms. You next have the option of requesting more than one copy of your document. Single, double or triple spacing can be selected by properly answering the next question to appear on the screen. Next you are asked if you want each printed page to be titled and numbered. If you reply "Y", you are requested to enter the titling information. Finally, printing will begin. If you indicated that you want to pause between pages, you will be requested to press the <enter> key before printing can start. Otherwise, printing is automatic and will continue until all the copies you requested

are completed. Pressing the BREAK (Shift/PAUSE) key at any time will halt the printing and interrupt the program.

We found this formatting program to be most useful and are pleased to include it here. It overcomes most of the serious limitations of the simplistic Shift/PRINT command. We wrote a companion program to it that prints the name and address portion of a letter on envelopes. It works like this; if the document you created is a piece of correspondence, and if it contains the mailing address within the first six lines, then this program will lift that information from the head of the letter and type it directly onto your envelopes. It's simple, but effective.

```
100 SCREEN 0,0:CLS:PRINT "ENVELOPE print program"
110 PRINT "FILES ON COMPUTER:"
120 DEFINT A-Z
130 CR$=CHR$(10):TB$=CHR$(9):FILES
140 INPUT "FILE NAME (MUST BE .DO FILE)";N$:OPEN N$ FOR
    INPUT AS 1
150 PRINT "Hit ENTER WHEN PRINTER IS READY."
160 B$=INKEY$:IF B$="" THEN 160
162 FOR X=1 TO 6
165 FOR C=1 TO 77
170 IN$=INPUT$(1,1):IF EOF(1) THEN 550
180 IF IN$(>)TB$ THEN 210
190 PR$=PR$+STRING$(8,32):C=C+7:GOTO 220
210 PR$=PR$+IN$:IF IN$=CR$ THEN E=77:GOTO 300
220 NEXT
300 LPRINT TAB(30)LEFT$(PR$,LEN(PR$)-2)
310 PR$=""
400 NEXT X
550 PRINT"PRINTING FINISHED":SCREEN 0,1:END
```

As with the PRINT.BA program listed previously, enter BASIC and type in each of the lines above exactly as shown. Then type SAVE "ENVLOP.BA " <enter> and the program will be available whenever you need it. When it is RUN, it also shows you the names of all the DO files first. After your selection, no other questions are asked. You signal that you have placed an envelope in your printer by pressing the <enter> key. The first six lines of your DO file are then typed out and the program ends.

Summary

In this chapter we have explored the TEXT mode that resides in every TRS-80 Model 100. The commands and functions of this program have been described, and an overview of word processing was presented. In addition, two helpful programs that supplement TEXT were listed for your use. Later, in Chapter 14, we will identify other available software that either augments or replaces TEXT. TEXT, the word processor of the Model 100, is a handy program, easy to master and work with. If the Model 100 offered no other features, TEXT alone would justify its cost.



CHAPTER 11 Conversing with Other Computers

TELCOM the TELeCOMmunications Software

The earliest computers were stand-alone machines that performed the tasks they were programmed to do and could communicate the results only to a printer. Later, various displays were added so the operators could witness the results of the activity and verify their entries. As computers proliferated, it was essential that they also have a means for transferring information from one computer to another. Small computers needed to be linked with large mainframes in a corporate environment. Government machines had to dispatch large amounts of data to remote computers throughout the country. In addition the need for world-wide communications became evident.

In one of the rare instances of standardization in the electronics industry, the RS-232C communication protocol was created. It describes both the hardware and software configuration that computers might have in order to effect the reliable transmission of data between them. These guide lines could be adopted by any computer manufacturer if they wished their machine to have the capability to access others.

In addition to the electronics housed within the computer itself, a device had to be developed that permitted ordinary phone lines to serve as the communication link. This device took the form of a MODulator/DEModulator (MODEM). A modem translates electronic impulses into specifically coded audio tones capable of passing both ways on

any telephone circuit (Figure 11-1). In practice, tens of thousands of computers use this technique to transfer information back and forth daily. Brokers access the Stock Exchange computers while newspaper people pour their stories into terminals linked across the nation. Numerous information services, discussed more fully in chapter 14, serve business and home computers 24 hours a day. Telecommunications between computers has become a taken-for-granted function that has enhanced the usefulness of these machines a hundred-fold.

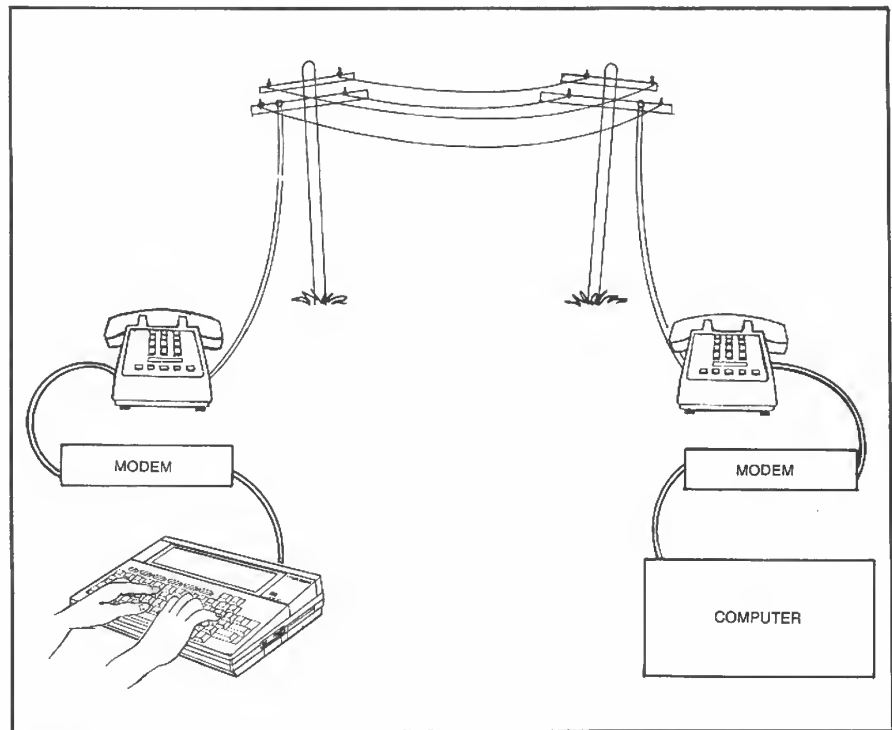


Figure 11.1 Computer to computer telecommunications

TELCOM

TELCOM is one of the five resident programs contained in the 32K ROM (Read Only Memory) of the TRS-80 Model 100. It is a routine that makes possible the link-up of the Model 100 and other computers in observance of the RS-232C protocol. With the help of TELCOM, you can transfer programs or data

files from the Model 100 to other machines (*Uploading*) or bring information into the machine from other sources (*Downloading*). Every significant parameter of the RS-232C protocol can be set by the user. These include:

1. Communication Speed (BAUD rate) —
from 75 to 19,200 bits per second
2. Parity —
odd, even, none or ignored
3. Word Length —
6, 7 or 8 bits per word
4. Stop Bits —
either 1 or 2
5. Line Status —
either enabled or disabled
6. Dial Pulse Rate —
either 10 or 20 pulses per second

It is not necessary to understand fully the technical aspects of each of these parameters. What is important is to make certain that both the sending and receiving terminals observe the same status. Reliable transmission can only take place if both parties are communicating at the same speed and with the same word structure, regardless of what that may be. There is not just one standard arrangement due to the variety of transmission lines and equipment. Ordinary telephone circuits cannot typically transmit data accurately at rates faster than 1200 baud. This slow rate is intolerable for some business applications, and other data links (microwave, land-lines, etc.) are employed for both speed-up and security reasons. Word length and parity also play a part in data reliability and are varied to suit the needs of the communicators.

While a modem (either the one built in to the Model 100 or an external one) is needed to communicate with a remote computer, a direct connection can be made between machines that are within a few hundred feet of each other. This also permits faster, more reliable transmission. TELCOM is versatile enough to handle either arrangement. The TRS-80

Model 100 has an internal modem that can be used for nearly all communication applications. This self-contained modem circuitry is one of the machines most desirable features as it precludes having to buy an extra, expensive accessory, as well as reducing the number of connections required. Additionally, the Model 100 can dial designated phone numbers automatically through the modem, a much-appreciated feature for the frequent user. Either a direct-connect Modem Cable (part number 26-1410) or an Acoustic Coupler cable (part number 26-3805) is required in order to make use of the built-in modem. These cables attach to the PHONE jack at the rear of the Model 100 and are then connected to a phone in one of two methods. The direct-connect Modem Cable can either replace your telephone handset (see Figure 11-2) by plugging into the wall phone receptacle or by intercepting the phone connection as illustrated in Figure 11-3. The Acoustic Coupler need only be used when your phone does not have a wall disconnect such as with payphones, hotel rooms or older installations (Figure 11-4). If the Acoustic Coupler arrangement is used, set the DIR/ACP switch (on the left side of the computer) to ACP. Otherwise leave it in the DIR (direct) mode. The auto dial-up feature referred to earlier is inoperative if the Acoustic Coupler cable is utilized.

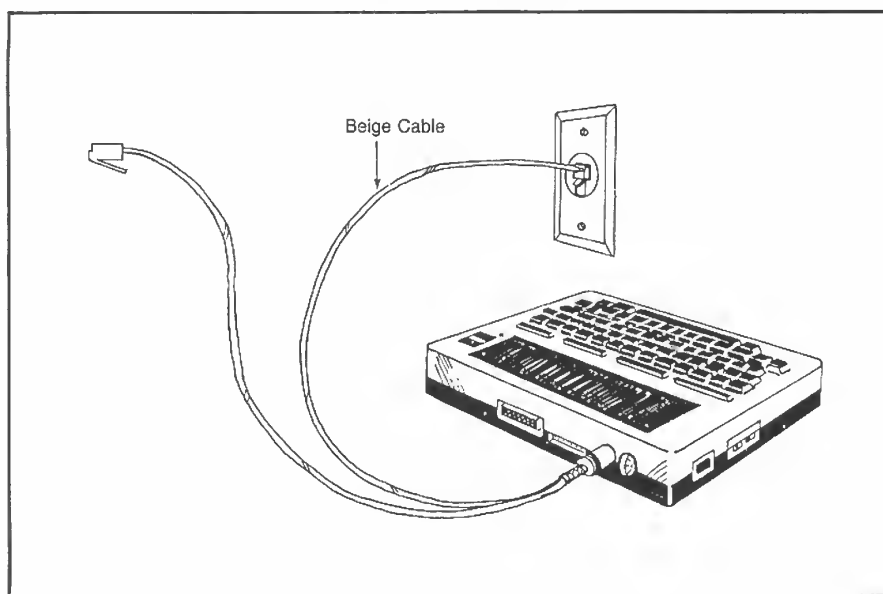


Figure 11.2 MODEL 100-to-telephone line connection

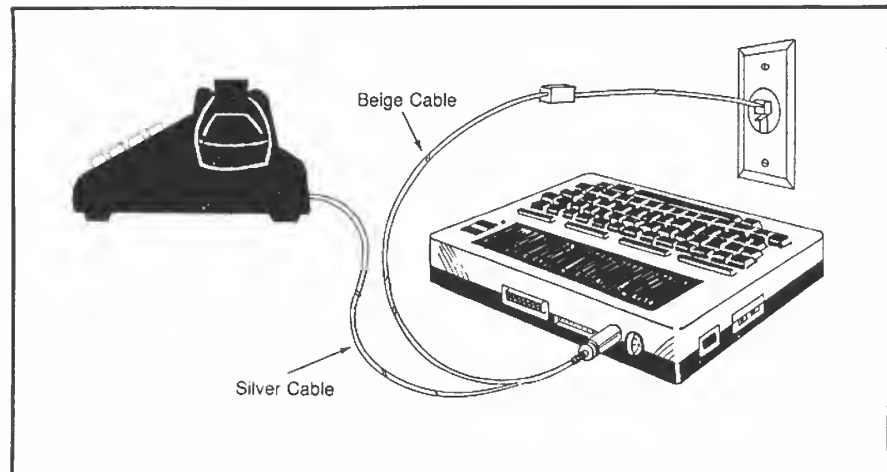


Figure 11.3 MODEL 100-to-telephone connection

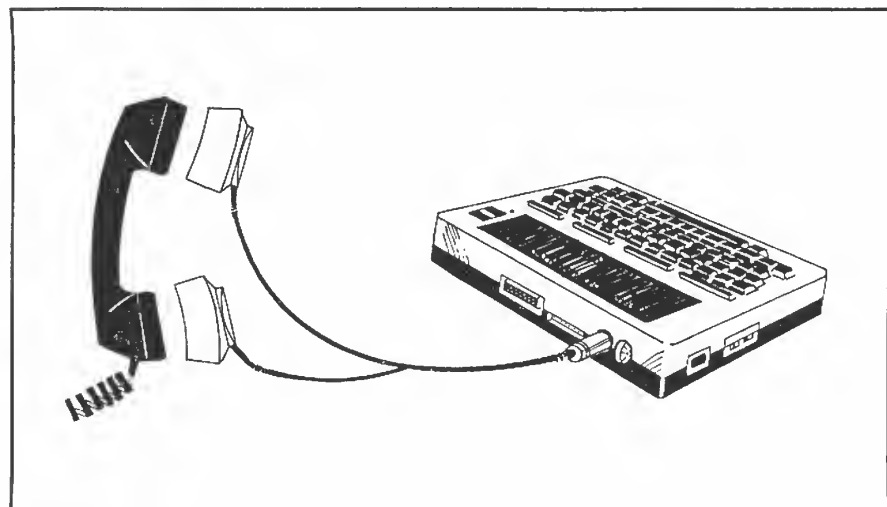


Figure 11.4 Connecting the MODEL 100 acoustic cups

NOTE: For nearly all of your telecommunications needs, set the ANS/ORIG switch on the side of the Model 100 to the ORIG (ORIGinate) position. The ANS (ANSwer) mode is used only when conversing with another computer that initiated the contact to your machine.

Though the internal modem is the preferred method of operation, there are occasions when communications can only be effected through the RS-232C port. If high-speed transmission is desired, an external modem is required since the built-in modem only operates at 300 Baud (about 27

characters per second). Chapter 14 identifies some modem manufacturers who produce 1200 Baud devices. This four-time increase in transmission speed reduces operating cost by nearly an equivalent amount. Depending upon your long term application for telecommunications, it may be expedient to invest in this accessory and operate through the RS-232C channel. In addition, if communications are to be made to a close-by computer without the need for phone line hook-up, then a direct RS-232C cable (such as that illustrated in Figure 3-5 of chapter 3) is utilized.

Working with TELCOM

To use the TELCOM program it is first necessary to make a cable connection in one of the ways described above. To summarize your choices:

1. If communication is to a nearby computer - use direct RS-232C cable between machines.
2. If communication is by phone line:
 - A. and speed of transmission is to be greater than 300 Baud - use RS-232C cable and external modem.
 - B. and speed is 300 Baud and phone has modern modular connectors - use modem cable and Model 100's internal modem.
 - C. and speed is 300 Baud but phone cannot be unplugged from wall - use acoustic coupler cable and Model 100's internal modem.

The most commonly used arrangement makes use of the internal modem of the Model 100 and the simple modem cable as suggested in 2B above. The acoustic coupler should be used only as a last resort because of reduced reliability and the lack of an auto dialing function. Unless long term savings can be effected, the 300 Baud rate of the internal modem is acceptable. With this configuration in mind, we will proceed with a step-by-step discussion of how TELCOM is used.

Starting TELCOM

Entry into the TELCOM program is accomplished by moving the main menu cursor over the word TELCOM and pressing the <enter> key. The display will then appear as shown in Figure 11-5. The current data transmission format status appears in the upper left hand corner of the screen. If it has never been altered by you, then the characters M7I1E,10 pps will be indicated. These figures refer to the communication protocol that TELCOM is set to use. It can be changed easily, as required, by pressing the F3 (Stat) function key. The parameter represented by each of the characters is as follows:

A. communication speed (baud rate)

M Internal MODEM operation (300)

1 75 bps (bits per second)

2 110 bps

3 300 bps (most frequently used)

4 600 bps

5 1200 bps

6 2400 bps

7 4800 bps

8 9600 bps

9 19200 bps

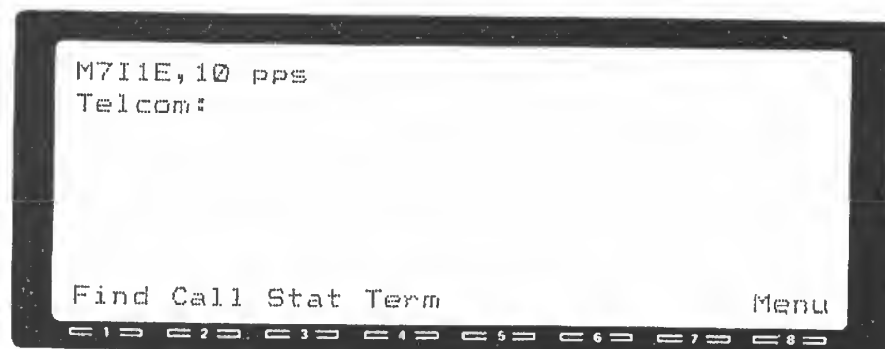


Figure 11.5 The TELCOM menu

Each of these speeds is roughly twice that of the preceding one. In actual practice, number M or 3 (300 Baud) is most commonly used for phone modem operation. More expensive modems (and high quality phone lines) can handle 1200 baud. Baud rates of 2400, 4800 and 9600 are used for hard-wire communications between adjacent computers or from a computer to a printer. Baud speeds of 75 and 110 date back to early teletype transmission and are not commonly in use today. The fastest baud rate, 19200, is not reliable and can introduce data errors if used under anything but the most stringent conditions.

B. Word Length

- 6 6 bits
- 7 7 bits
- 8 8 bits

C. Parity

- I Ignore parity
- O Odd parity
- E Even parity
- N No parity

D. Stop Bit

- 1 1 stop bit
- 2 2 stop bits

E. Line Status

- E Enable (XON)
- D Disable (XOFF)

F. Pulse Rate

- 10 10 pps (pulses per second)
- 20 20 pps

The status of M7IIE,10 pps, therefore, represents a data transmission speed of 300 Baud through the internal modem (see Figure 11-6). The word length is 7 bits with 1 stop bit. Parity is ignored and line status is enabled. The dialing rate is 10 pulses per second. This is the ideal setting for accessing the various information services such as DOW-JONES using the internal modem of the Model 100. If the status is not appropriate for your application then it may be changed by pressing F3

and responding to the "Stat" prompt by typing in that combination of letters that relates to your requirement. For example, if you wish to communicate through the RS-232C port with a direct cable to an adjacent computer at 9600 Baud, No parity, 8 bit word length with one stop bits and with line status disabled you would enter:

88N1D <enter>

No dialing speed (pulse rate) need be entered. It is not relevant in direct communications but will default to 10 pps because that was the previous setting. Pressing the F3 key again will bring the stat prompt back if you wish to verify your setting. If you respond this time by pressing the <enter> key only, the status of 88N1D, 10 pps will be shown. The TRS-80 Model 100 remembers the last status selected by you and displays it whenever you enter TELCOM. It is not necessary to repeat a desired setting once it has been entered. The first character must always be "M" if the internal modem is used. The characters 1 thru 9 refer to connections made to the RS-232C port only.

Manual and Automatic Dialing. Whenever the prompt "Telcom:" appears on the display, you are in the

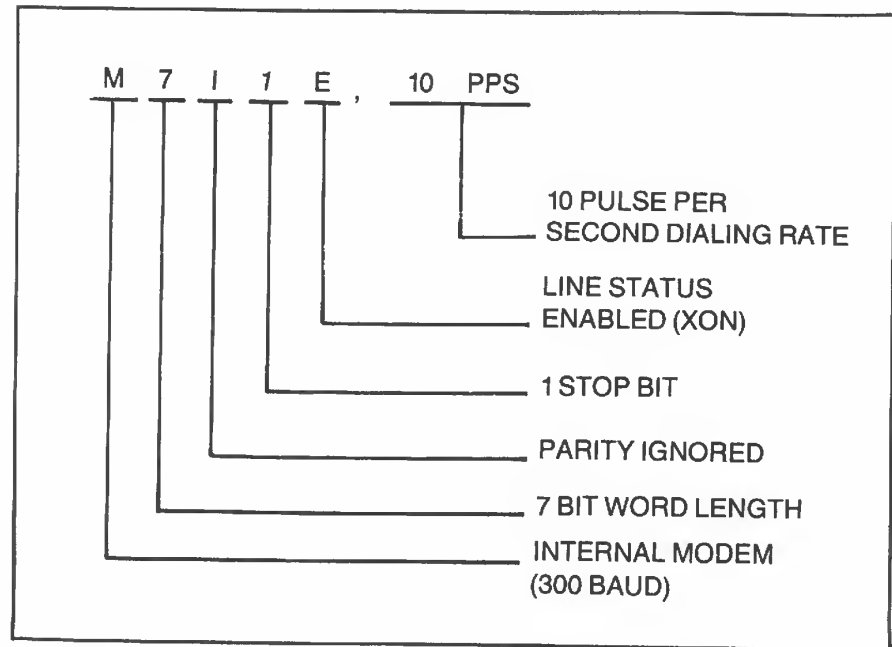


Figure 11.6 Telecom status representation

entry mode. If you are using the internal modem and the status code has been set to an "M" designation then the Model 100 can be used to dial phone numbers for you either manually or automatically. Automatic dial-up is accomplished in conjunction with numbers stored by you in an ADRS.DO file created prior to entering TELCOM. Manual dialing can be accomplished either by lifting the receiver and dialing the number you wish or by pressing the F2 (Call) function key and typing in the number. Leave the receiver on the hook during the time that the digits are being displayed but take it off the hook as soon as the last number has been dialed by the Model 100.

Before automatic dial-up can be accomplished you must prepare one or more listings in a document file labelled as ADRS.DO. This can be done by following these steps:

1. From the Main Menu, enter TEXT (move the dark cursor over the word TEXT using either the space bar or the cursor arrow keys and press <enter>).
2. When TEXT asks, "File to edit?", reply, ADRS and press <enter>.
3. Type in any code name you wish to identify the computer you will be calling followed by the phone number. For example, you may call CompuServe at toll-free (800) 848-8990 and ask the operator for the "Free Demo" access phone number in your city. In the Los Angeles area it is 739-8906. In the ADRS file you would type:

```
CS :7398906<>:<enter>
```

4. Press the F8 function key to return to the Main Menu and then enter TELCOM.

Any number of listings can be added to the ADRS.DO file. The phone number should be followed by the characters < and > and bracketed by colons (:) and may be followed by any other information you wish, such as:

```
CS :7398906<>:Compu-Serve <enter>
```

When you are in the entry mode you can implement

automatic dial-up by pressing the F1 (Find) function key and responding to the "Find" prompt by typing in the code letters (i.e. CS) that you stored in ADRS.DO file. The display will echo the code and the number it retrieved that corresponds to that party. The bottom label line also will change to show new selections for the function keys. The F3 key (More) when pressed will bring up the next entry in your ADRS file and in this manner you can search from top to bottom for the number you wish to contact if you are not certain of the assigned code name. The F4 (Quit) key will return you to the previous TELCOM menu if you should decide to abort the Find procedure. The F2 (Call) key when pressed will start the automatic dialing procedure.

When the high-pitched tone that signals a computer contact has been made is heard, you will automatically enter the TERM mode and your Model 100 will be on line with the other computer. Pressing the F5 (Echo) key will send any information that is presented on the display to your printer as well. This is useful if a hard-copy of your communications is required. Each pressing of the F5 key alternately turns the printer on and off. In this manner, you can capture relevant messages if you wish and let incidental data scroll by without being printed.

Once you are "on-line" with another computer, the function key label line will change to present six new options (see Figure 11-7). They are:

F1 Prev

Pressing this function key will change the display and allow you to view the previous screen. It is a means for you



Figure 11.7 The terminal mode menu

to “go back” and see the data which most frequently had scrolled off the top of the display.

F2 Down

The F2 function key controls the capability for you to “Download” a data or program file from the other computer to your Model 100. It is the means by which an entire file that is resident on the other machine can be transferred to your computer and be captured in memory. In this way, a useful BASIC program that might be located on CompuServe’s database can be passed to you. When the F2 key is pressed, you are prompted to give a name to the “File to Download?”. Any file name (no longer than six characters) can be used. Don’t use a file name you have previously assigned as the incoming information will be put into this file as it is received. The reverse video message, “Down” will appear at the bottom of the display during the data transfer period. Pressing F2 again will end the downloading process and the new file can be found listed when you next return to the Model 100 Main Menu.

F3 Up

F3 performs the “uploading” function, the means by which you can transfer one of the Model 100 files to the other computer. The prompting message, “File to Upload?” is answered by naming the file that you want to send to the other machine. You will be asked next for the “Width:”. This refers to the length for each line of your document and defaults to a value of 40 (the Model 100’s display width) if you simply press the <enter> key. Other values may be used but in most instances should not exceed 80. As with downloading, the word “Up” will appear in reverse video during the period that the transfer is being done. When it changes back to normal, the file (or document) has been sent and pressing the F3 key again ends the procedure.

F4 Full

The F4 function key lets you switch between full and half duplex operation. Most situations require that you be in the full duplex mode. This means that any character you type is first sent to the other computer which then echoes it back to your display. You are assured of good commu-

nications if what you see is what you entered. Half duplex operation would produce two of each character you type on the display - once before it was transmitted, and again when it came back from the other computer.

F5 Echo

As mentioned previously, pressing the F5 key will send whatever appears on the screen to your printer. If your printer is "offline" TELCOM will stall while waiting for it to respond. Repeated pressing the F5 key will turn the printer off and on.

F8 Bye

Pressing the F8 key will disconnect the phone line and exit the Terminal mode of operation. The message, "Disconnect?" will appear on the display. Typing Y (for yes) will terminate your communication with the other computer and restore the original function key definitions (Figure 11-5) to the bottom line of the display.

In summary then, the chart shown in Figure 11-8 illustrates that TELCOM has three modes of operation. At start up, TELCOM is in the entry mode. You choices here allow you to either "find" a phone number, manually "call" a number, examine or modify the current "status", enter the "terminal" mode or return to the Model 100's Main Menu. If you enter the FIND mode, you may then automatically call the number, search for "more" numbers or "quit" and return to the ENTRY mode. If you choose to enter the TERMINAL mode,

ENTRY MODE ↓		F1	F2	F3	F4	F5	F6	F7	F8	
F1	FIND →		CALL	MORE	QUIT					← FIND MODE
F2	CALL									
F3	STAT									
F4	TERM →	PREV	DOWN	UP	FULL	ECHO			BYE	← TERMINAL MODE
F5										
F6										
F7										
F8	MENU									

Figure 11.8 TELCOM function key definitions

then you may examine the “previous” display, “download” or “upload” a file, switch from “full” to “half” duplex operation, “echo” your display to your printer or say good “bye” to the computer with which you were communicating.

Automatic Log-on. Whenever you communicate with one of the information services such as CompuServe or The Source, a log-on procedure must be followed. Typically, you are requested to enter your identification number (User ID) and password. These important responses identify you to the service so that proper billing can be accomplished. You may also be asked to type in a character representing the type of computer or terminal you are calling from. This information allows the service to format its communication to you so as to fit your display and printer. If you use an information service frequently, it can be tedious to repeat these responses each time you wish to sign-on. One of the most helpful features of the TRS-80 Model 100's TELCOM program is the ability to store your log-on responses in the ADRS.DO file along with the phone number of the service and to have the Model 100 automatically insert your replies as the questions are posed. This is accomplished in a novel manner that uses various symbols and characters to represent the presumed questions and your replies. Auto Log-on can only be used with the Auto Dial-up function, which, in turn, can only be used with the Model 100's internal modem. As discussed previously, the ADRS.DO file can be used to store numerous phone numbers for automatic dialing. Each stored number is followed by the < > symbols. The information you put inside these two symbols is called the Auto Log-on Sequence. You must follow a logical order of events when constructing the Auto Log-on Sequence. That is, you must first wait for a question to be asked before offering a reply. It is also necessary to pause in anticipation of a slow response to your input. The following symbols, along with letters and numbers, serve to control the log-on procedure.

? Question Mark - Wait for a specified character

The question mark represents the phrase “wait for”. If you know that the information service is going to ask for your “User ID”, you should place the symbols ?U in your Auto Log-on Sequence. This is the same as telling the

Model 100 to “wait for the letter U to be received”. The correct form of either upper or lowercase characters must be used. It is not necessary to type in the entire message (i.e. ? User ID), just the first letter is sufficient.

= Equal sign - Pause for two seconds

The pause command is only necessary if the other computer is expecting to receive a character from you as the first action of the log-on procedure. It is generally advisable to allow some time before the procedure begins. By doing so, you are more certain that contact has been established before starting your communications. Longer pauses are permitted. Six seconds is represented by typing three equal signs in succession (= = =).

! Exclamation mark - Send a specific character

If the characters you are required to send as part of your response are either the question mark (?) or the equal sign (=), it is necessary to precede them with an exclamation mark so that they won't be misinterpreted as control signals as explained above. In other words, the exclamation mark permits the Model 100 to distinguish between commands such as ? or = and your responses which may include the same symbols.

^ Caret - (Shift/6) - Identifies control character

Some of your auto log-on responses may consist of a control code such as the <enter> key or Control/C. The caret sign (^) must precede these codes so that they are not misinterpreted by the other computer. ^M is the same as the <enter> key and ^C is identical to the Control/C function.

Figure 11-9 serves to illustrate how these symbols are used to create an auto log-on sequence for communications with CompuServe. In the example given, the TRS-80 Model 100 will automatically dial the local access number for CompuServe and give the correct responses to gain access to their free demonstration. The sequence is entered into the ADRS.DO file which you previously created. You can go there directly from the TRS-80 Model 100's Main Menu by moving the cursor (the black background shadow) over the filename, ADRS.DO and pressing the <enter> key. When the

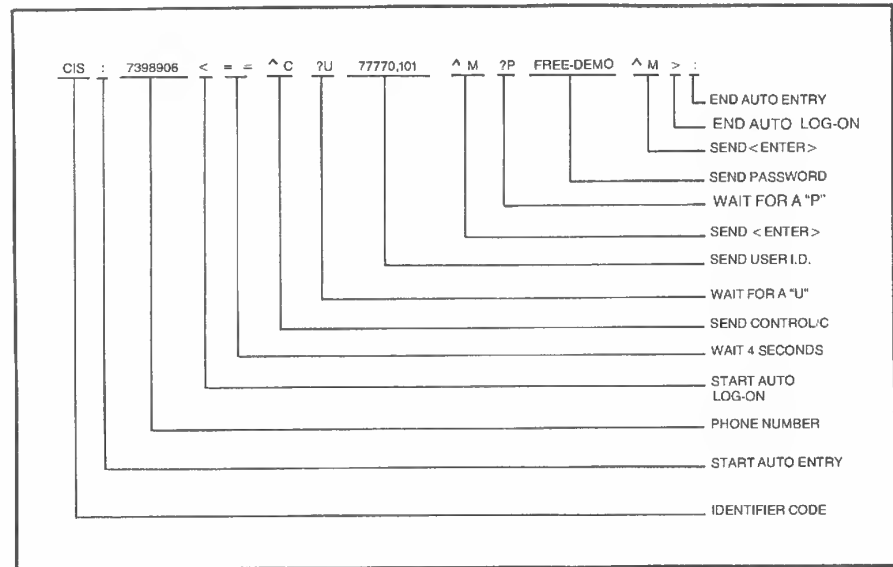


Figure 11.9 Complete auto entry, auto log-on sequence

file appears, pressing the Control key and the down arrow key simultaneously will move you to the end of the file and ready for an additional entry. The sequence begins by typing CIS, which is an arbitrary code that stands for CompuServe Information Service. You may enter anything here that you wish. It is best not to use the same CS entry that served for a previous example. Each of these codes in the ADRS.DO file should be unique.

A colon is entered next signifying the start of an auto entry sequence. This is followed by the local access telephone number for CompuServe which may be obtained from them by calling (800) 848-8990. A < symbol is next to signal the start of an auto log-on sequence which begins with two equal signs (= =). They represent a four second pause after the number has been reached and allow for a firm connection to CompuServe before any additional communications take place. A control/C is then included and is typed as ^ C. The ^ (caret) symbol is created by pressing the shift key and the numeral 6 simultaneously. The next entry is ?U which means, "wait for a capital letter U to be sent by CompuServe". The response to that is 77770,101 which is a reserved CompuServe user identification code for free demonstrations. A ^ M (which represents the <enter> key) is typed in next. A ?P is entered next and translates to, "wait for CompuServe to transmit a

capital P". That would be the first letter in the request, "Password". FREE-DEMO (in capital letters) is your reply and is entered here. Finally, another ^ M followed by > and : ends the entire Auto Entry/Auto Log-on sequence. Pressing the <enter> key followed by the F8 key will return you to the Main Menu. You may now enter TELCOM again and, using the Find and Call commands, directly log-on to a trial demonstration of CompuServe.

Summary

This chapter has introduced you to the remarkably powerful and versatile world of telecommunications on the TRS-80 Model 100. No other instrument of comparable size to this "notebook" computer has the capability to link you with the numerous information services and electronic bulletin boards that are available. The built in modem of the Model 100 provides the most convenient and minimal amount of hardware necessary. TELCOM's ease of use satisfies all the requirements for reliable two-way computer communications. The Auto Entry and Auto Log-on features merely add to the long term convenience of using Model 100 as your personal "Window to the World".



CHAPTER 12 Storing Names and Numbers

ADDRSS - The Address Organizer

The TRS-80 Model 100 microcomputer contains five resident software programs. Previous chapters have described the three most important of these; BASIC, TEXT and TELCOM. The remaining two application programs are useful but less significant in their purpose and versatility. The first of this pair of near identical packages is ADDRSS. Its function is to permit you to store and retrieve names, addresses and phone numbers. If that were all that it did, it would be no more valuable than a well-managed Rolodex file. Its uniqueness lies in the manner in which you can retrieve this information. A set of Rolodex cards can be arranged in only one way, typically alphabetically by last name. To retrieve a card it is usually necessary, therefore, to know the correct spelling of the individuals name. With ADDRSS, the records are not stored in any special order and may be extracted by merely recalling a portion of a name, street, city or any other coded item of identification you choose to use. In addition, the file created by ADDRSS (ADRS) is accessible by the TELCOM program as described in chapter 11. Automatic dialing of a friend or business acquaintance can be accomplished from within TELCOM by drawing upon the records you create with the ADDRSS program.

Working with ADDRSS

The ADDRSS application program may be selected by pressing the <enter> key when the cursor has been placed over the word ADDRSS in the Main Menu. As you enter the program, ADDRSS automatically looks for its companion record file titled ADRS.DO. If it is not present in your machine then ADDRSS displays the message, "ADRS.DO not found - Press space bar for "MENU". You have no choice but to take this option, return to the Main Menu and then select the TEXT program instead. When TEXT asks you for "File to edit?", your response should be ADRS. Following that, you begin by entering names, addresses, phone numbers and identification codes, if desired. Although no special format is necessary for these entries, a few special rules apply. Always type a colon (:) before and after a telephone number so that TELCOM can recognize it and allow you to use the Auto-Dial feature. Always end an entry by pressing <enter>. This separates one record from the next. Entries may be longer than one line. Entries may be made in any order and may be added or deleted as frequently as you wish. As with any other document file, ADRS.DO is maintained by entering the TEXT program and calling for it, or by selecting it directly from the Main Menu. Its uniqueness lies in the fact that both TELCOM and ADDRSS are programmed to draw information from it, and only it. In other words, ADRS.DO is a reserved document file which you create and maintain solely for the storage and retrieval of names and phone numbers.

Once you have created an ADRS.DO file, the ADDRSS program will provide unique retrieval capabilities. As Figure 12-1 illustrates, you are offered three choices whenever you re-enter the program.

F1 (Find)

Pressing the F1 key brings the word "Find" to the screen. If you enter a name or any word or number that is contained in one or more of the ADRS.DO records, the corresponding

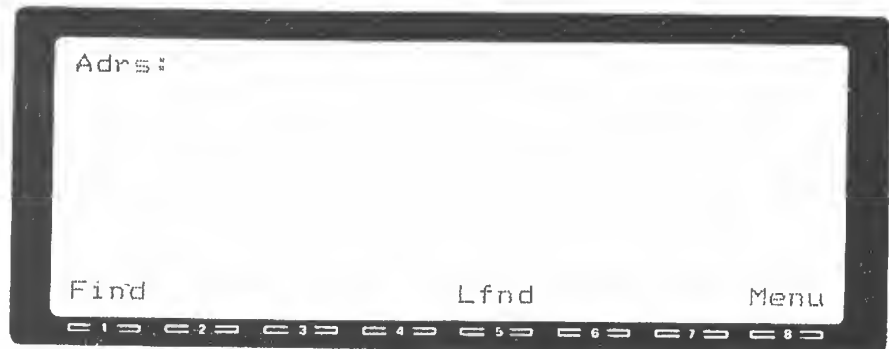


Figure 12.1 ADDR5 function key definitions

records will be displayed. If they exceed six lines, the label will display the commands, "More" and "Quit". Pressing F3 (More) will bring another screenful to the display. F4 (Quit) will return you to the original menu.

If you answer the "Find" prompt by simply pressing the <enter> key, then the program will respond by showing you every record on file in the order in which they were entered. "More" and "Quit" will let you scan through the whole file or return to the beginning.

It is only necessary to type in a portion of a name or address in order to retrieve the corresponding record. The program searches every record, in turn, and displays any that contain the key word. Upper and lowercase are ignored so that typing "fred" would retrieve both FRED JOHNSON and Frederick Olson. A more sophisticated use of this search capability can be demonstrated by creating coded records. For example; a symbol that looks like an airplane can be entered as the first character of a record by pressing the GRPH key and the letter "a" simultaneously. This would be followed by the name and phone number of a local airline company. Numerous records listing all the airlines and their numbers could be created in the ADDR5.DO file in this manner. Thereafter, when you are in the ADDR55 program, pressing the F1 key and responding to the "Find" question with GRPH/a will bring all airline information to your display. Other symbols that represent a telephone (GRPH/p), male and female figures, and an automobile (Figure 12-2) allow you to create numerous sets of coded entries. The possibilities are limited only by your imagination.

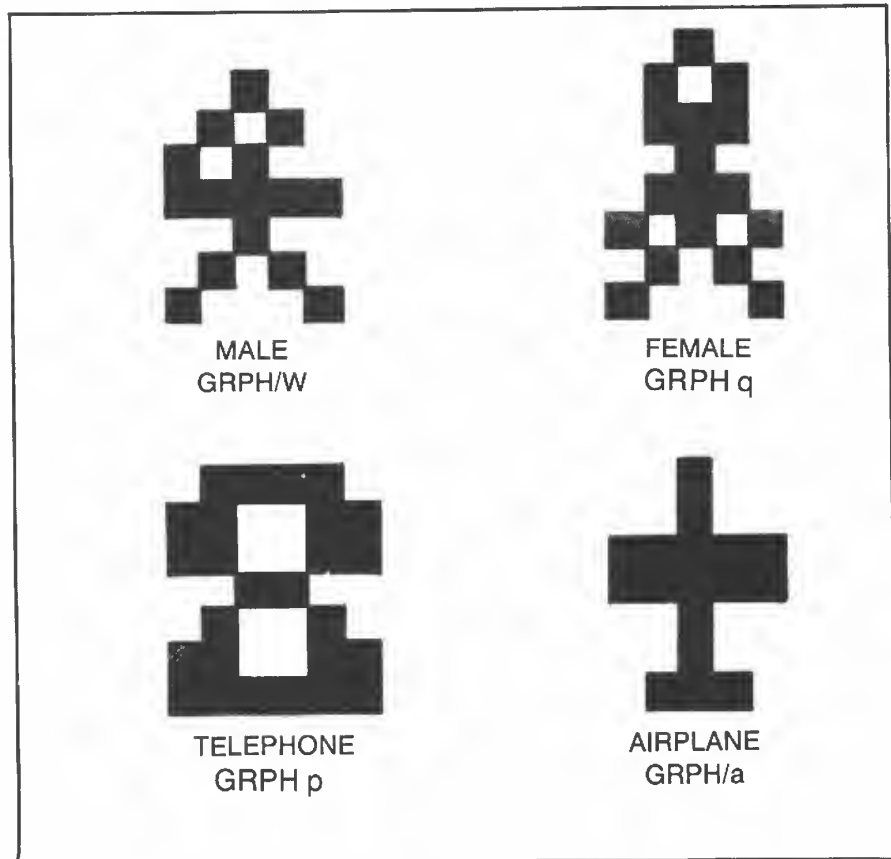


Figure 12.2 Useful symbols for address codes

F5 (Lfnd)

If you wish to have a print-out of the records you select for retrieval, pressing the F5 key (Lfnd) rather than the F1 (Find) function key will direct the results to your printer. In other words, F5 works exactly the same as F1 except that the information is listed on your printer rather than on the display.

F8 (Menu)

As with all other resident application programs, pressing the F8 function key will end your session with the ADDRSS program and return you to the Main Menu.

The LABEL key, when pressed, will alternately display the definitions of the function keys or remove the information from the screen.

Summary

This brief chapter has provided an overview of the resident Address Organizer program (ADDRSS). Like the TELCOM program, the ADDRSS program makes exclusive use of a reserved data file named ADRS.DO which you create and maintain. All additions and changes to the data file are done using the TEXT program, but retrieval of the information stored therein is accomplished by this useful utility program, ADDRSS. If imaginative and clever coding is incorporated in the name and address records you create, then retrieval by subject or category can be accomplished.



CHAPTER 13 Booking your Appointments

SCHDL - The Schedule Organizer

Chapter 12 provided a detailed description of the ADDRSS program that is built-in to the Model 100. A nearly identical program titled SCHDL is also available to you as a selection from the Main Menu. It works in much the same manner as ADDRSS. Before using the program, you must create a special, reserved document file using TEXT. The .DO file that is reserved for ADDRSS (and TELCOM as well), is identified as ADRS.DO. The unique document file that the SCHDL program works with is labeled NOTE.DO. Where the ADDRSS program is designed to retrieve records of names and addresses, the SCHDL program is intended to serve as an appointment book.

Working with SCHDL

The SCHDL application program is selected by pressing the <enter> key when the cursor has been placed over the filename SCHDL in the Main Menu. When you enter the program, SCHDL looks for its companion document file, NOTE.DO. If it has not yet been created then SCHDL displays the message, "NOTE.DO not found - Press space bar for MENU". Your only alternative is to take this step, return to the Main Menu and then select and enter the TEXT program. When TEXT asks for "File to edit?", your response should be NOTE. It is not necessary to add the .DO suffix as TEXT

supplies this to all document files it creates. Following that step, you begin by entering appointments, schedules of activities, or virtually any important note that you want to keep track of. Entries can be longer than one line. Always end an entry by pressing the <enter> key. This separates one record from the next. Entries can be in any order and may be changed or deleted when necessary. The NOTE.DO file is maintained in the same manner as any other TEXT file. Its uniqueness lies in the fact that it is a reserved file for use by SCHDL only.

Once you have created the NOTE file and have a number of records in it, the SCHDL program can provide some unique retrieval capabilities. When you re-enter the SCHDL program following the creation of the NOTE document file, you are greeted by the display illustrated in Figure 13-1. You are offered three choices, as follows:

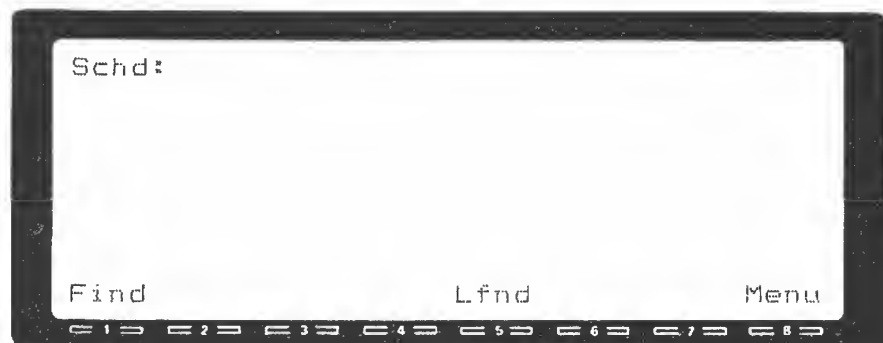


Figure 13.1 SCHDL function key definitions

F1 (Find)

Pressing the F1 key displays the word “Find” following the word “Schd:” on the display. If you enter a word or date or any other portion of a record that you had stored in the NOTE file, the entire record (or records) will be retrieved and displayed. If, for example, you had stored three records that read:

July 10 — lunch with Fred @ noon

July 30 — Barber appointment — 1:30

August 7 — Dodger game (Padres) — 7:30

If you entered "July" after pressing the F1 key, the first two items would come to the screen. If you entered "July 10", only the first would appear. Typing in "Dodger" would retrieve the last record only. No special format is necessary for your records but it is advisable to be consistent in your entries. If the retrieved records exceed six lines on the display the commands, "More" and "Quit" will appear over the F3 and F4 function keys. Pressing F3 will bring another screenful to the display. F4 will return you to the original menu ready for another entry.

If you respond to the "Find" prompt by simply pressing <enter>, then the program will show you every record on file in the order they were entered. "More" and "Quit" will let you scan through the entire file or return to the SCHDL menu.

As with the ADDRSS program, upper and lowercase is ignored in the search for matching records. Also; the same innovative use of symbols and codes will permit you to make categorical searches and retrievals of information. If, for example, you preceeded your flight itinerary with the airplane symbol (GRPH/a), then all flight times could be brought to the screen by merely typing GRPH/a in response to the "Find" prompt. The phone symbol (GRPH/p) is a natural character to use as a code for calls you have to make, or are expecting. Applying the same imaginative concepts to the design of your NOTE.DO file as suggested with the ADRS.DO file will yield useful and efficient results.

F5 (Lfnd)

The F5 key works the same as the F1 (Find) function key except that the retrieved records are channeled to your printer rather than the display. This provides a hard copy list of your appointments and spares you from having to jot them down off the screen.

F8 (Menu)

As with all the other resident application programs, pressing the F8 key will terminate your session with SCHDL and return you to the Main Menu. The NOTE document file is preserved and can be accessed by TEXT for further updating.

The LABEL key may be used at any time to either display or remove the definitions of the function keys on the last line of the screen.

Summary

This chapter has described the operation of the resident Schedule Organizer program (SCHDL). It details the means for creating and updating the special document file titled NOTE.DO which works in conjunction with SCHDL. TEXT is the program that maintains the NOTE file, but SCHDL is the program that is used to search, retrieve and display (or print) the desired records. Though suggested as an appointment scheduling utility, the program can be cleverly used to store and selectively retrieve notes, important dates to remember, and other items of interest.

CHAPTER 14 Add-On Products & Services

Software

In typical fashion, numerous software publishers have created applications programs which they market to TRS-80 Model 100 owners. These programs range from sophisticated spreadsheet generators to word processors and games. All of them are packaged on cassettes and are accompanied by documentation with instructions for program operation. It is beyond the scope of this book to provide a detailed critique of the dozens of programs presently available. What follows, however, is a categorical listing of some advertised software and the various producers who offer it. A mention here is not to be construed as an endorsement of the material. Whenever possible, you should attempt to get a demonstration copy or locate a review of the program that interests you before investing in it. Because of the quickly changing nature of software publishing, no list such as this could hope to be current or complete. The monthly publications that are listed elsewhere in this chapter are your best guide to what is available.

Word Processors and Print Formatters

THE TRAVELING WRITER
Traveling Software, Inc.
11050 Fifth Avenue Northeast
Seattle, WA 98125
(206) 367-8090

TEXT POWER

The Covington Group
310 Riverside Drive, Suite 916
NY, NY 10025
(212) 678-0064

AUTOPEN

Chattanooga Systems Associates
P. O. Box 22261
Chattanooga, TN 37422
(615) 892-2339

Electronic Spreadsheets

AMERICAN CALC

American Micro Products, Inc.
705 North Bowser
Richardson, TX 75081
(214) 238-1815

PORTACALC

Skyline Marketing Corp.
4510 W. Irving Park Rd.
Chicago, IL 60641
(312) 286-0762

Tax Planning and Preparation

PORTATAX

Skyline Marketing Corp.
4510 W. Irving Park Rd.
Chicago, IL 60641
(312) 286-0762

THE TRAVELING TAX MANAGER

Traveling Software, Inc.
11050 Fifth Avenue Northeast
Seattle, WA 98125
(206) 367-8090

TAX PREP
DatAccount
516 S.E. Morrison, Suite 820
Portland, OR 97214
(503) 232-0490

Statistical Analysis

PORTASTAT
Skyline Marketing Corp.
4510 W. Irving Park Rd.
Chicago, IL 60641
(312) 286-0762

Graphic Plotting

AUTOPLOT
Menlo Systems
3790 El Camino Real, Suite 221
Palo Alto, CA 94306
(415) 856-0727

DataBase Management

DATA +
Portable Computer Support Group
11035 Harry Hines Blvd., No. 207
Dallas, TX 75229
(214) 351-0564

DATA-DEX
DatAccount
516 S.E. Morrison, Suite 820
Portland, OR 97214
(503) 232-0490

One program that is currently being offered is worthy of special mention. It is called Disk+ and is being sold by the Portable Computer Support Group (11035 Harry Hines Blvd.

207, Dallas, TX 75229 214-351-0564). This unique program serves as a "poor man's Disk/Video Interface". With it you are able to extend your Model 100's storage capabilities by transmitting your files to either an Apple, IBM, or Radio Shack Model 4 computer, which you might own, and store them on their floppy disks. The files may be retrieved as required and you are spared the expense of purchasing Radio Shack's Disk/Video Interface unit. Though this program does not provide the larger display capabilities that the Radio Shack Disk/Video Interface does, it does duplicate the disk storage ability of that useful, albeit expensive, peripheral.

Many more programs are certain to become available for the TRS-80 Model 100 in the near future. Software publishers who have created packages for Tandy's Model 100 are translating their programs to run on the NEC microcomputer (the model PC-8201A) as well. When ordering from any publisher, be sure to specify the Model 100 as tapes created for one machine will not load onto the other.

Peripherals

Outside suppliers have also come forth with various peripheral devices that are compatible with the Model 100 and enhance its performance. A cross-section of some of these offerings is listed below.

High Speed Tape Storage System

PMD-100
Holmes Engineering, Inc.
5175 Green Pine Drive
Salt Lake City, UT 84123
(801) 261-5652

Data Acquisition System

PL-100
Elexor Associates
P. O. Box 246
Morris Plains, NJ 07950-0246
(201) 299-1615

Auxilliary Power Supply

PRAIRIE POWER
Bluestem Productions
P. O. Box 334
Wayzata, MN 55391
(612) 471-7795

Telephone Modem

AJ 1212-ST
Anderson Jacobson
521 Charcot Ave.
San Jose, CA 95131
(408) 286-7960

SMARTMODEM
Hayes Microcomputer Products
5923 Peachtree Industrial Blvd.
Norcross, GA 30092
(404) 441-1617

Bar Code Reader

Model 100 BCR
Tandy Corporation
300 One Tandy Center
Fort Worth, TX 76102
(817) 390-2842

Bi-Tech
BT Enterprises
10 Carlough Road
Bohemia, NY 11716-2996
(516) 567-8155

Accessories

Add-On Memory Modules

8K RAM Module
Purple Computing
4807 Calle Alto
Camarillo, CA 93010
(805) 987-4788

8K RAM Module
Spectrum Projects
93-15 86th. Drive
Woodhaven, NY 11421
(212) 441-2807

Desk Top Stand

POCO STAND
Diskus Products
6003 Bandini Blvd.
Los Angeles, CA 90040
(213) 726-3088

Carrying Case

American Tourister
91 Main Street
Warren, RI 02885
(800) 341-6311

CHIP-TOTE
Kangaroo Video Products Inc.
9190 Manor Drive
La Mesa, CA 92041
(619) 698-0230

Publications

More than 150 magazines devoted to microcomputers are presently being published in the United States and Europe. A few of these publications are dedicated solely to the Briefcase Computer and feature articles and information which relates exclusively to the smaller machines. A brief list of a few leading publications is included here.

Portable Computer
500 Howard Street
San Francisco, CA 94105
(415) 397-1881

Portable 100
67 Elm Street
Camden, ME 04843
(207) 236-4365

PCM - The Portable Computing Magazine
9529 U. S. Highway 42, Box 209
Prospect, KY 40059
(502) 228-4492

Creative Computing
39 East Hanover Ave.
Morris Plains, NJ 07950
(201) 540-0445

Information Services

Within the last few years, a number of computerized subscription news services have come into existence. Using the internal modem in conjunction with your TRS-80 Model 100 (chapter 11) can put you in communication with any of them. They all charge for their services and usually require a sign-up fee that earns you a unique password used for billing purposes. Each of them has a special orientation; from financial

news and encyclopedic databases to games and informal "tele-chatting." An overview of the four largest of these services is offered here.

DOW-JONES NEWS/RETRIEVAL

P. O. Box 300

Princeton, NJ 08540

(800) 257-5114

Rates: Standard Usage — One-Time fee \$75

Prime Time - \$.60 to \$1.20 per min. (depending on service)

Non-Prime Time - \$.20 to \$.90 per min.

Services Offered:

Business and Economic News

Stock Quotations

Financial and Investment Services

General News and Information Services

Mail Service and Customer Newsletter

THE SOURCE

1616 Anderson Road

McLean, VA 22102

(703) 734-7500

Rates: Standard Usage — One-Time fee \$100

Prime Time - \$20.75 per hour

Non-Prime Time - \$7.75 per hour

Services Offered:

Communications (SourceMail, Chat, Mailgram)

News and Sports

Business and Finance

Consumer Services

Entertainment/Games

Travel Services

Publishing

NEWSNET

945 Haverford Road
Bryn Mawr, PA 19010
(800) 345-1301

Rates: Standard Usage — No subscription fee

Prime Time - \$24.00 to \$48.00 per hour (SCAN or READ)

Non-Prime Time - \$18.00 to \$40.00 per hour

Services Offered:

International Newswires
Newsletter Search and Excerpt
NewsFlash
Electronic Mail

COMPUSERVE

P. O. Box 20212
5000 Arlington Centre Blvd.
Columbus, OH 43220
(800) 848-8199

Rates: Standard Usage — \$30 subscription fee

Prime Time - \$6.00 per hour

Non-Prime Time - \$12.50 per hour

Services Offered:

Information Utilities
Games and Entertainment
Electronic Mail

The fees listed above are approximate and change as a function of the services requested. In addition, they all offer special "get-acquainted" rates from time to time. Free literature, describing the current services and rates, is available from any of the above.

There are also over 2000 free *Computer Bulletin Boards* in the country. These BBS's (Bulletin Board Service) have limited informational services and usually feature a means for users to hang electronic notes on an imaginary bulletin board for each other to read. The cost is limited to your phone-

connect charges only. A directory of over 1300 of the currently active ones is available by sending \$2.00 to:

Thomas Wnorowski
3352 Chelsea Circle
Ann Arbor, MI 48104

His interesting little publication can furnish you with local numbers that will allow you to practice your "log-on" telecommunications procedures.

A COMPUERVE Demonstration

A free demonstration of how the subscriber information services work is possible. Because free time is not given during prime hours, you can stage this demo only between the hours of 6 P.M. and 5 A.M. (your local time) weekdays or most any hour on the weekend. Refer to the section on TELCOM in this book (chapter 11) for step-by-step instructions on linking up with CompuServe. Once you have made contact with CompuServe, you will be able to explore the various menus and services that they have to offer. You will not be able to actually take advantage of the services but you will get a good idea of what is available. The demo is free and your only cost will be the price of the local phone call.

Summary

This chapter introduced you to the world of TRS-80 Model 100 compatible software, hardware and services. From memory chips to accounting packages, it has attempted to offer a taste of the available programs, services and accessories provided by manufacturers other than Radio Shack. This is but a sampling of such goods and services. Most surely, in the months and years to come, a proliferation of add-ons will appear on the market as the usefulness and versatility of the TRS-80 Model 100 becomes more popularly recognized.

APPENDIX A CONTROL KEY CODES

CHARACTER CODE	KEYBOARD ENTRY	PROGRAM	FUNCTION
0	CTRL/@	—	none
1	CTRL/A	TEXT	Cursor 1 word left
2	CTRL/B	TEXT	Cursor to bottom
3	CTRL/C	ALL	STOP
4	CTRL/D	TEXT	Cursor 1 char. right
5	CTRL/E	TEXT	Cursor 1 line up
6	CTRL/F	TEXT	Cursor 1 word right
7	CTRL/G	TEXT	Saves a .DO file
8	CTRL/H	ALL	BackSpace
9	CTRL/I	ALL	Tab
10	CTRL/J	—	none
11	CTRL/K	—	none
12	CTRL/L	TEXT	Select
13	CTRL/M	ALL	<enter>
14	CTRL/N	TEXT	Find
15	CTRL/O	TEXT	Copy
16	CTRL/P	—	none
17	CTRL/Q	TEXT	Cursor to left-end of line
18	CTRL/R	TEXT	Cursor to right-end of line
19	CTRL/S	TEXT	Cursor 1 char. left
20	CTRL/T	TEXT	Cursor to display top
21	CTRL/U	TEXT	Cut
22	CTRL/V	TEXT	Load
23	CTRL/W	TEXT	Cursor to file start
24	CTRL/X	TEXT	Cursor 1 line down

CHARACTER CODE	KEYBOARD ENTRY	PROGRAM	FUNCTION
25	CTRL/Y	TEXT	Print entire file
26	CTRL/Z	TEXT	Cursor to file end
27	ESC	ALL	Begin Escape Sequence
28	→	TEXT	Cursor Right
29	←	TEXT	Cursor Left
30	↑	TEXT	Cursor Up
31	↓	TEXT	Cursor Down

APPENDIX B ESCAPE SEQUENCES

BASIC STATEMENT	FUNCTION
PRINT CHR\$(27)"A"	Cursor Up
PRINT CHR\$(27)"B"	Cursor Down
PRINT CHR\$(27)"C"	Cursor Right
PRINT CHR\$(27)"D"	Cursor Left
PRINT CHR\$(27)"E"	Clear Display
PRINT CHR\$(27)"H"	Move cursor to Home position
PRINT CHR\$(27)"J"	Erase from cursor to end of page
PRINT CHR\$(27)"K"	Erase from cursor to end of line
PRINT CHR\$(27)"L"	Insert a blank line at cursor position
PRINT CHR\$(27)"M"	Delete line at current cursor position
PRINT CHR\$(27)"P"	Turn on Cursor
PRINT CHR\$(27)"Q"	Turn off Cursor
PRINT CHR\$(27)"T"	Set system line (lock line 8)
PRINT CHR\$(27)"U"	Reset system line (unlock line 8)
PRINT CHR\$(27)"V"	Lock display - no scrolling
PRINT CHR\$(27)"W"	Unlock display - scrolling
PRINT CHR\$(27)"Y";"x";"y";"<expression>"	Locate cursor at column x, row y and print expression
PRINT CHR\$(27)"j"	Clear Display
PRINT CHR\$(27)"p"	Set reverse character mode
PRINT CHR\$(27)"q"	Turn off reverse character mode

APPENDIX C BASIC COMMANDS, FUNCTIONS AND STATEMENTS

COMMAND	PROPER FORMAT
ABS	ABS(<numeric expression>)
AND	<operand 1> AND <operand 2>
ASC	ASC(<string>)
ATN	ATN(<numeric expression>)
BEEP	BEEP
CALL	CALL <address> { <expression1> } { <expression2> }
CDBL	CDBL(<numeric expression>)
CHR\$	CHR\$(<numeric expression>)
CINT	CINT(<numeric expression>)
CLEAR	CLEAR { string size area > } { , <maximum memory used in BASIC> }
CLOAD	CLOAD " <file name> " { , R }
CLOADM	CLOADM " <file name> "
CLOAD?	CLOAD? " <file name> "
*CLOSE	CLOSE { { # } <file number> } { , { { # } , file number > } } . .
CLS	CLS
COM	COM ON - COM OFF - COM STOP

COMMAND	PROPER FORMAT
CONT	CONT
COS	COS(<numeric expression>)
CSAVE	CSAVE "<file name>" {,A}
CSAVEM	CSAVEM "<file name>", <start address.>, <end address>, <entry address>
CSNG	CSNG(<numeric expression>)
*CSRLIN	CSRLIN
DATA	DATA <constant> {,<constant>}
DATE\$	DATE\$ = "<month>/<day>/<year>"
DAY\$	DAY\$ = "<day of week>"
DEF	DEFINT - DEFSGGL - DEFDBL - DEFSTR <range>
DIM	DIM <variable name> (<max subscript value> {,<max subscript value>. . . })
**DSKI\$	DSKI\$(<drive,track,sector,switch>)
**DSKO\$	DSKO\$(<drive,track,sector,switch,expression>)
EDIT	EDIT {<starting line>} {-<ending line>}
END	END
*EOF	EOF(<file number>)
EQV	<operand 1> EQV <operand 2>
ERL	ERL
ERR	ERR
ERROR	ERROR<integer>
EXP	EXP(<numeric expression>)
FILES	FILES
FIX	FIX(<numeric expression>)
FOR	FOR <variable name> = <initial value> TO <final value> {STEP <increment>}
FRE	FRE(<expression>)
GOSUB	GOSUB<line number>
GOTO	GOTO<line number>
HIMEM	HIMEM
IF/THEN/ELSE	IF <expression> THEN <clause> {ELSE <clause> }
IMP	<operand 1> IMP <operand 2>
INKEY\$	INKEY\$
INP	INP(<port number>)
INPUT	INPUT{"<prompt statement>";} <variable 1> {,<variable 2>}. . .
*INPUT\$	INPUT\$(<integer expression> {,{#} <file number>})
*INPUT #	INPUT # <file number>, <variable 1> {,<variable 2>}. . .

COMMAND	PROPER FORMAT
INSTR	INSTR({numeric expression > , } < char.string 1 > , < char.string 2 >)
INT	INT(<numeric expression >)
IPL	IPL " < filename > "
KEY	KEY < key number > , " < function > " KEY < key number > ON - OFF - STOP
KEY LIST	KEY LIST
*KILL	KILL " < filename.file type > "
LCOPY	LCOPY
LEFT\$	LEFT\$(< char. string > , < numeric expression > }
LEN	LEN(< character expression >)
**LFILES	LFILES < drive number >
LINE	LINE{ < x1/y1 > }- < x2/y2 > { , < switch > , < B / BF > }
LINE INPUT	LINE INPUT { " < prompt statement > " ; } < string variable >
*LINE INPUT #	LINE INPUT # < file number > , < variable 1 > { , < variable 2 > } . . .
LIST/LLIST	LIST/LLIST { < starting line number > } { - < ending line number > } < file name > " { , R }
*LOAD	LOAD " { < external device name > : } < file name > " { , R }
*LOADM	LOADM " { < device : > } < filename > "
**LOC	LOC (< file number >)
**LOF	LOF(< file number >)
LOG	LOG(<numeric expression >)
LPOS	LPOS(<numeric expression >)
LPRINT	LPRINT { " } { < expression > } { " }
LPRINT USING	LPRINT USING < format string > ; < num. exp. list >
MAXFILES	MAXFILES = < number of files >
MAXRAM	< variable > = MAXRAM
MDM	MDM ON/OFF/STOP
MENU	MENU
*MERGE	MERGE " { < external device name > : } < file name > "
MID\$	MID\$(< character string > , < numeric expression 1 > { , < numeric expression 2 > }) { = < character string 2 > }
MOD	< numeric expression 1 > MOD < numeric expression 2 >
MOTOR	MOTOR < switch >
*NAME	NAME " < old file name > " AS " < new file name > "
NEW	NEW

COMMAND	PROPER FORMAT
NEXT	NEXT{ < numeric variable > }
NOT	NOT < operand >
ON. .GOTO	ON < numeric variable > GOTO < line number >
ON. .GOSUB	ON < numeric variable > GOSUB < line number >
ON COM. .GOSUB	ON COM GOSUB < line number >
ON ERROR	ON ERROR GOTO < line number >
ON KEY	ON KEY GOSUB < line number list >
ON MDM	ON MDM GOSUB < line number >
ON TIME\$	ON TIME\$ = " < time > " GOSUB < line number >
*OPEN	OPEN "{ < external device name > : } < file name > " INPUT FOR OUTPUT AS { # } < file number > APPEND
OPEN "COM"	OPEN "COM: { < rwpbs > } " INPUT FOR OUTPUT AS { # } < file number >
OR	< operand 1 > OR < operand 2 >
OUT	OUT < port number > , < data >
PEEK	PEEK(< address >)
POKE	POKE < address > , < data >
*POS	POS(< expression >)
POWER	POWER < time > , { , RESUME } OFF CONT
PRESET	PRESET) < horizontal, coordinate > , < vertical coordinate >)
PRINT	PRINT { " } { < expression > } { " }
*PRINT #	PRINT # < file number > , < expression list >
PRINT USING	PRINT USING < format string > ; < num. expr. list >
PRINT # USING	PRINT # < file number > , USING < format string > ; < expression list >
PSET	PSET(< horizontal coordinate > , < vertical coordinate >)
READ	READ < variable list >
REM	REM < remark >
RESTORE	RESTORE { < line number > }
RESUME	RESUME { NEXT - < line number > }
RETURN	RETURN
RIGHT\$	RIGHT\$(< character string > , < numeric expr. >)
RND	RND(< numeric expression >)

COMMAND	PROPER FORMAT
*RUN	RUN { <line number> }, {,R}
	RUN "{ <device name> : } <program name> "{,R}
*RUNM	RUNM "{ <device name> : } <filename> "
*SAVE	SAVE " { <external dev. name> : } <file name> "{,A}
*SAVEM	SAVEM " { <device name> : } <filename> ", <start address> , <end address> , <entry address>
*SCREEN	SCREEN <switch> , <switch>
SGN	SGN(<numeric expression>)
SIN	SIN(<numeric expression>)
SOUND	SOUND <tone> , <length> SOUND ON/OFF
SPACE\$	SPACE\$(<numeric expression>)
SQR	SQR(<numeric expression>)
STOP	STOP
STR\$	STR\$(<numeric expression>)
STRING\$	STRING\$ (<numeric expr. > <character expr. >)
TAB	TAB(<numeric expression>)
TAN	TAN(<numeric expression>)
TIME\$	TIME\$ = " <hour> : <minute> : <second> " TIME\$ON/OFF/STOP
VAL	VAL(<numeric string>)
VARPTR	VARPTR <variable>
**WIDTH	WIDTH 40 or 80
XOR	<operand 1> XOR <operand 2>

NOTES: Some commands and functions are also used in Disk BASIC if the Radio Shack Disk/Video Interface is connected. Commands marked with one asterisk (*) require drive number identification if intended for Disk operation:

(i.e. KILL "<drive number> : <filename.file extension> ")

Commands or functions marked with two asterisks are unique to Disk BASIC:

(i.e. LFILES <drive number>)



APPENDIX D TEXT CONTROL COMMANDS

CURSOR OPERATION	CTRL OPERATION	FUNCTION
→	CTRL/D	Move 1 character to right
←	CTRL/S	Move 1 character to left
↑	CTRL/E	Move up one line
↓	CTRL/X	Move down one line
SHIFT/→	CTRL/F	Move one word to right
SHIFT/←	CTRL/A	Move one word to left
SHIFT/↑	CTRL/T	Move up one screen
SHIFT/↓	CTRL/B	Move down one screen
CTRL/→	CTRL/R	Move to right end of line
CTRL/←	CTRL/Q	Move to left end of line
CTRL/↑	CTRL/W	Move to beginning of file
CTRL/↓	CTRL/Z	Move to end of file



APPENDIX E BASIC ERROR MESSAGES

ERROR MESSAGE	ERROR NO.	M100-BASIC MESSAGE	MEANING
?AO	53	Already Open	The same file has been opened before.
* ?AT	59	Bad Allocation Table	Disk Directory Allocation Table is damaged.
?BN	51	Bad Number	The file number is inappropriate.
?BS	9	Bad Subscript	Subscript out of range.
?CF	58	File not Open	The file has not yet been opened.
?CN	17	Not possible to go ON	Execution can't be resumed after CONT command.
?DD	10	Double Dimension	The same array is declared twice.
* ?DF	63	Disk Full	No more room on designated disk.
* ?DN	60	Bad Drive Number	Incorrect Drive number was used.
?DS	56	Direct Statement	An ASCII file does not load.
?EF	54	End of File	No more data in the file.
?FC	5	Function Call (illegal)	Commands or functions used incorrectly.
* ?FE	62	File Already Exists	Designated filename has been used.
?FF	52	File not Found	The designated file name is not on record.
?FL	57	File Limit	There are too many files.
?ID	12	Illegal Direct	The specified command cannot be used in the direct mode.

ERROR MESSAGE	ERROR NO.	M100-BASIC MESSAGE	MEANING
?IE	50	Internal Error	An error has occurred within BASIC itself.
?IO	18	Input or Output error	An error occurred during input/output operation.
?LS	15	Long String	A string variable exceeded 255 characters.
?MO	22	Missing Operand	A required parameter is missing.
?NF	1	NEXT without FOR	There is no FOR command to match a NEXT command.
?NM	55	Name (file) Mismatch	File name is inappropriate.
?NR	19	No RESUME	RESUME command missing in error routine.
?OD	4	Out of Data	Insufficient DATA for READ command.
?OM	7	Out of Memory	There is insufficient memory.
?OS	14	Out of String space	Reserved memory for strings inadequate.
?OV	6	Overflow	A numerical value is too large.
?RG	3	RETURN without GOSUB	A RETURN statement is present without GOSUB.
?RW	20	RESUME Without Error	RESUME encountered before error routine.
?SN	2	Syntax error	Erroneous grammar or spelling in statement.
?ST	16	String formula too complex	The string formula used is too complicated.
?TM	13	Type Mismatch	The types of variables are inconsistent with one another.
* ?TS	61	Bad Track/Sector	Disk has a bad track or sector.
?UE	21 23-49 64-255	Undesignated Error	Undesignated error has been encountered.
?UL	8	Undefined Line	A designated line is not present in the program.
?/0	11	Division by Zero	A division by zero was attempted.

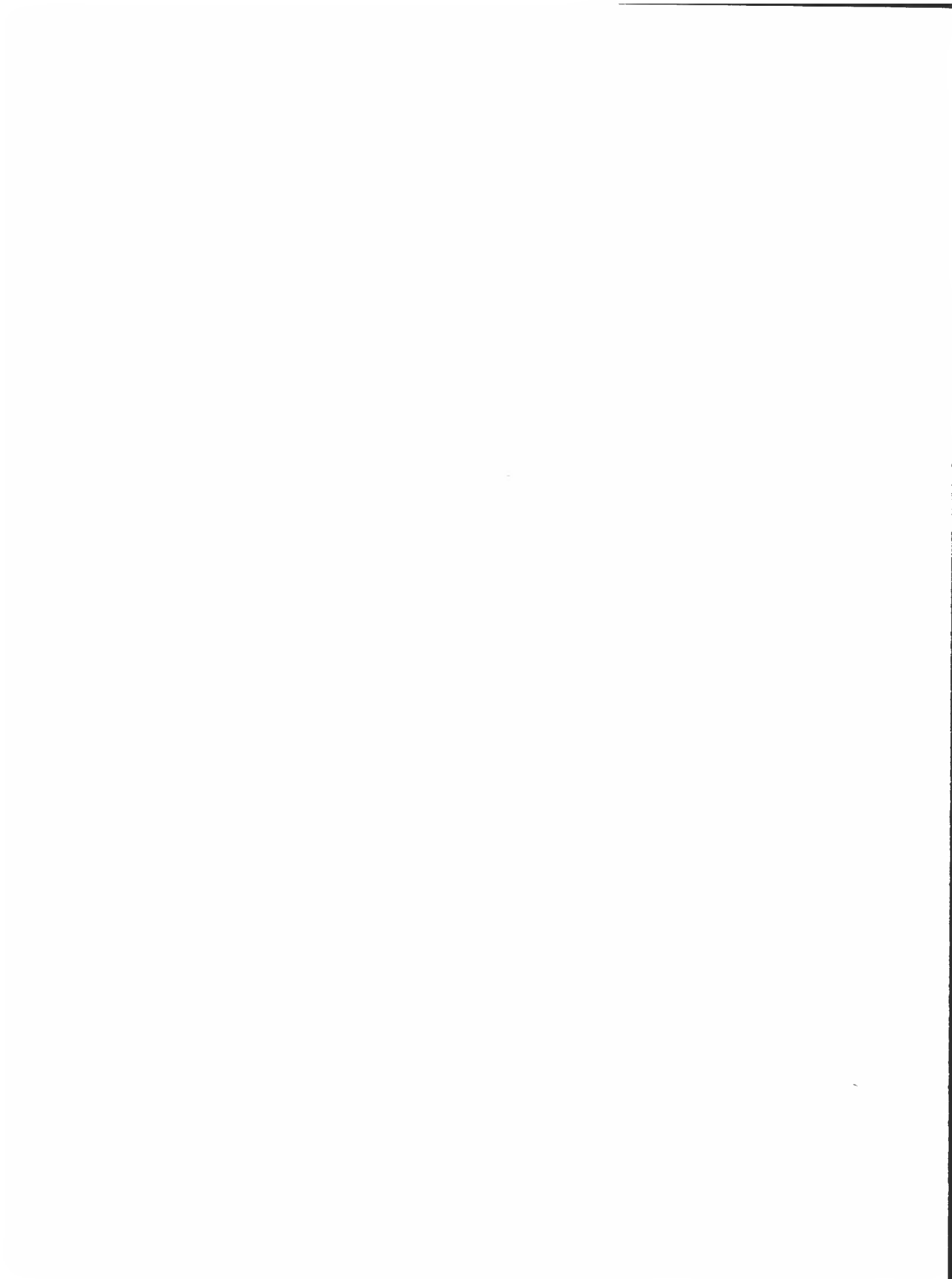
Note: Error messages preceded by an asterisk (*) are used in Disk BASIC only.

APPENDIX F CHARACTER CODES

DECIMAL VALUE	CHARACTER GENERATED
0 to 31	Unique codes that are unprintable (see Appendix A)
32	(space)
33	!
34	"
35	#
36	\$
37	%
38	&
39	'
40	(
41)
42	*
43	+
44	,
45	-
46	.
47	/
48	0
49	1
50	2
51	3
52	4
53	5
54	6
55	7

DECIMAL VALUE	CHARACTER GENERATED
56	8
57	9
58	:
59	;
60	<
61	=
62	>
63	?
64	@
65	A
66	B
67	C
68	D
69	E
70	F
71	G
72	H
73	I
74	J
75	K
76	L
77	M
78	N
79	O
80	P
81	Q
82	R
83	S
84	T
85	U
86	V
87	W
88	X
89	Y
90	Z
91	[
92	\ (GRPH/-)
93]
94	^
95	-
96	(modified apostrophe) (GRPH/[)
97	a

DECIMAL VALUE	CHARACTER GENERATED
98	b
99	c
100	d
101	e
102	f
103	g
104	h
105	i
106	j
107	k
108	l
109	m
110	n
111	o
112	p
113	q
114	r
115	s
116	t
117	u
118	v
119	w
120	x
121	y
122	z
123	{ (GRPH/9)
124	: (GRPH/–)
125	} (GRPH/0)
126	~ (GRPH/])
127	(no character) (DEL)
128-255	Graphic Symbols, (see Appendix I)



APPENDIX **G COMMUNICATIONS PARAMETERS**

In the TELCOM mode, STAT is used to define the desired communication parameters. They take the form:

STAT <C B P S U R> where:

- C = Communications speed (BAUD rate)
- B = Word length
- P = Parity
- S = Stop bits
- U = Line status control
- R = Dial pulse rate

The available values for each of these parameters is:

<u>PARAMETER</u>	<u>TYPE</u>	<u>FOR</u>
Communication Speed	1	75 Baud
	2	110
	3	300
	4	600
	5	1200
	6	2400
	7	4800
	8	9600
	9	19200
Word Length	M	Modem (300)
	6	6 bit length
	7	7 bit length
	8	8 bit length

PARAMETER	TYPE	FOR
Parity	N	No parity
	E	Even parity
	O	Odd parity
	I	Parity bit ignored
Stop Bit	1	1 stop bit
	2	2 stop bits
Line Status	E	Enable (XON)
	D	Disable (XOFF)
Dial Pulse Rate	10	10 pulses per second
	20	20 pulses per second

Note: Parity bit ignored (I) must be used with 8 bit word length (8).

If M is used for communication speed then the TRS-80 Model 100 uses the PHONE connector and speed is set at 300 Baud. All other speeds (1 thru 9) are directed to the RS-232C port connector.

APPENDIX H OPTIONAL EQUIPMENT SPECIFICATIONS

AC Adapter — 26-3804

- * Conserves batteries
- * 6 volts D.C. — 400 milliamps.

Acoustic Coupler — 26-3805

- * Connects to any telephone

Parallel Printer Cable — 26-1409

- * Centronics compatible

Direct-Connect Modem Cable — 26-1410

- * Connects to modular phone jack
- * Includes one free hour on CompuServe and Dow Jones News/Retrieval

System Briefcase — 26-3809

- * Protects computer when travelling
- * Holds Model 100, cassette recorder and cables

Cassette Recorder — CCR-81

- * Inexpensive off-line data and file storage
- * Operates on batteries or AC power
- * Suitable for audio recording as well

8K RAM Expansion Chip — 26-3816

- * 8K by 8 bit CMOS memory chip
- * Low-power
- * Model 100 has sockets for up to 4 chips

Disk/Video Interface Unit — 26-3806

- * Provides floppy-disk storage for Model 100
- * Outputs for both TV set and monitor
- * Increases display size to 25 lines by 80 characters
- * Additional Disk BASIC commands available
- * Supports both sequential and random access files

Bar Code Reader — 26-1183

- * Plug compatible with TRS-80 Model 100
- * Includes cassette software

Software

Investment Analysis — 26-3824

Statistical Analysis — 26-3825

Calculator — 26-3827

Function Plotter — 26-3834

Personal Finance — 26-3822

BASIC Language Lab — 26-3821























Executive Calendar — 26-3833







































Starblaze 100 — 26-3840

For further information contact:

Radio Shack — a division of Tandy Corporation
1700 One Tandy Center
Fort Worth, TX 76102

APPENDIX I GRAPHIC SYMBOLS

KEYBOARD CHARACTER	USED WITH GRPH Key	BASIC CHR\$()	USED WITH CODE Key	BASIC CHR\$()
a		133		182
b		149		---
c		132		162
d		---		187
e		143		198
f		130		---
g		---		---
h		134		---
i		142		199
j		---		203
k		155		201
l		154		202
m		129		---
n		150		205
o		152		183

KEYBOARD CHARACTER	USED WITH GRPH Key	BASIC CHR\$()	USED WITH CODE Key	BASIC CHR\$()
p		128		172
q		147		200
r		137		---
s		139		169
t		135		---
u		145		184
v		---		189
w		148		---
x		131		161
y		144		204
z		---		206
A		235		177
B		---		---
C		255		171
D		237		215
E	 (left)	233		214
F		238		191
G		253		---
H		251		---
I		243		213
J		244		219
K		250		217
L		249		218
M		246		165

KEYBOARD CHARACTER	USED WITH GRPH Key	BASIC CHR\$()	USED WITH CODE Key	BASIC CHR\$()
N		---		---
O		242		178
P		241		---
Q	(upper)	231		216
R	(right)	234		170
S		236		185
T		252		186
U		240		179
V		---		222
W	(lower)	232		---
X		239		223
Y		254		220
Z		224		---
/		138		174
0		---		175
1		136		192
2		156		---
3		157		193
4		158		---
5		159		---
6		180		---
7		176		196
8		163		194

KEYBOARD CHARACTER	USED WITH GRPH Key	BASIC CHR\$()	USED WITH CODE Key	BASIC CHR\$()
9		---	8	195
!	⌘ (upper left)	225	À	208
"		---	ˆ	164
#	⌘ (lower left)	227	É	209
\$	(lower right) ⌘	228		---
%	⌘	229		---
&		---	Ò	212
'	⌘	140	˙	160
(---	Ô	211
)		---	÷	166
*		---	ï	210
+		---	†	168
,	↓	153	Ù	188
-		---	ˆ	197
.	⌘	151	8	207
:	⌘	245		---
;	⌘	146	⌘	173
<	⌘	248	Ò	221
=	⌘	141	ˆ	190
>	⌘	247		---
@	(upper right) ⌘	226		---
_		---	ˆ	167
[---	ˆ	181
^	⌘	230		---

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